MODERN
Machine Shop
May, 1933

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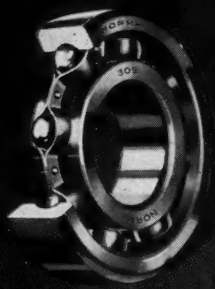

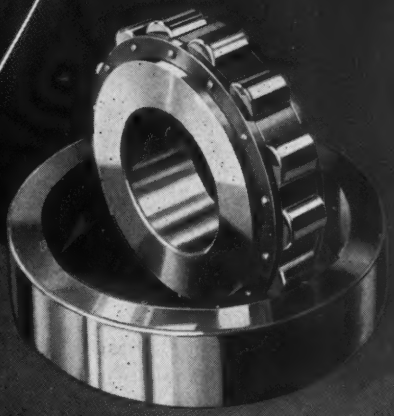

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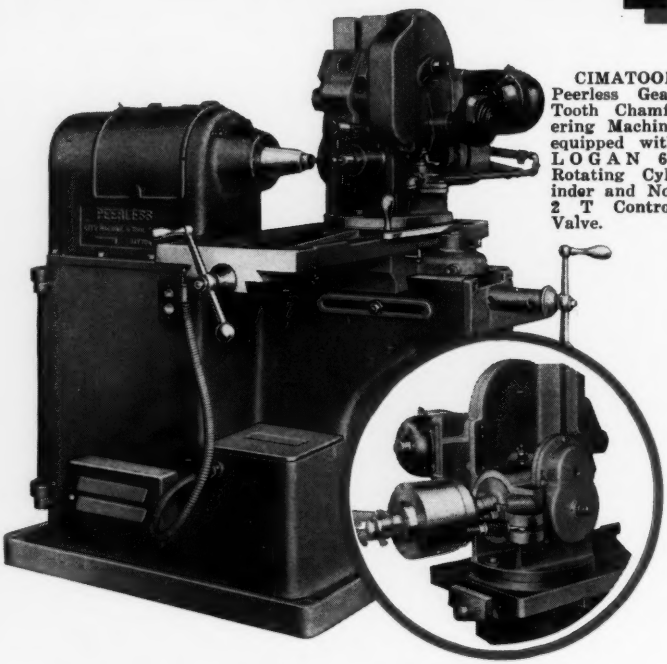

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IMPORTANT NOTE

Modern Machine Shop

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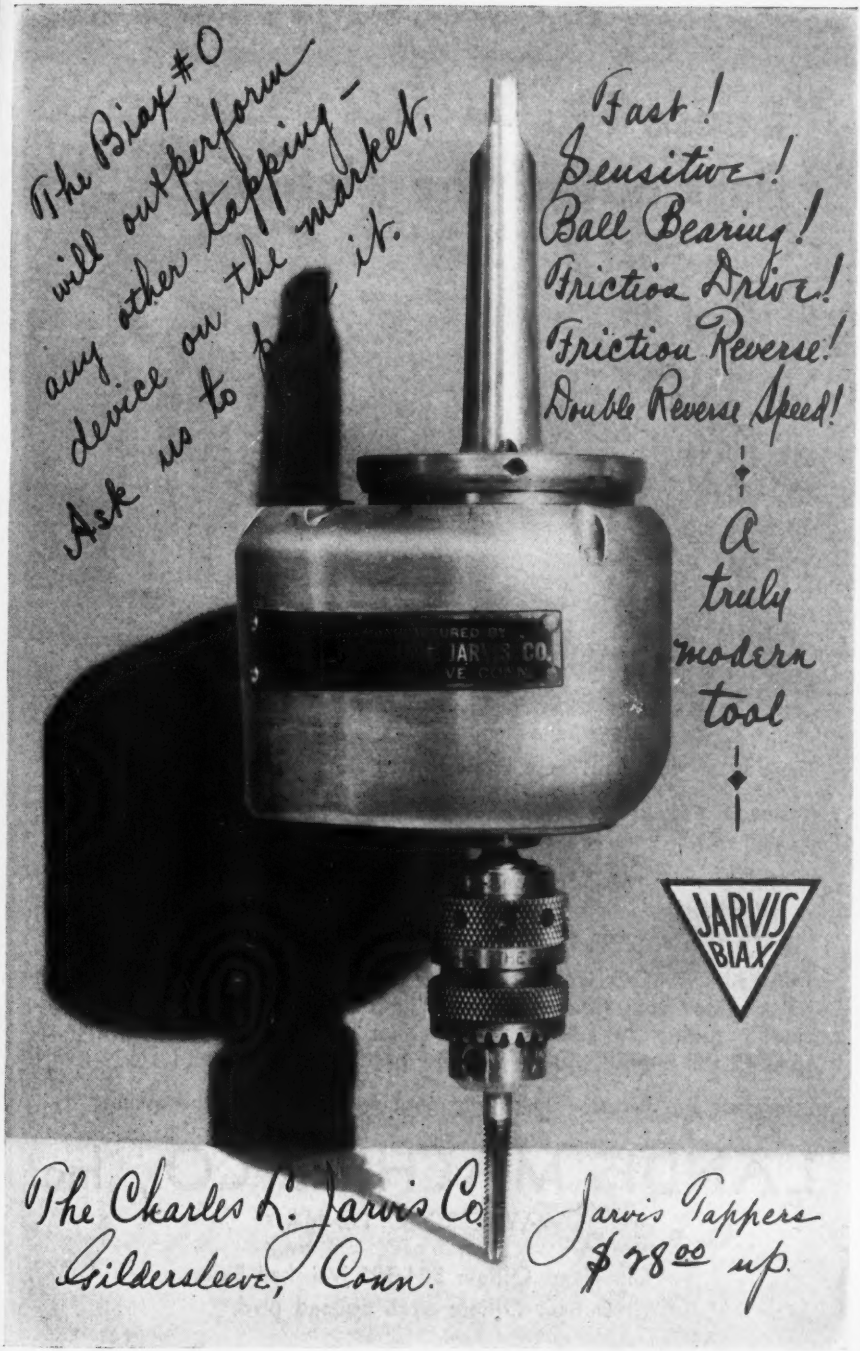
Due to lack of business, No magazine was published for APRIL 1933, consequently the series goes

VOLUME 5 MARCH 1933 NUMBER 10

TO

VOLUME 5 MAY 1933 NUMBER 12

From Fred W. Vogel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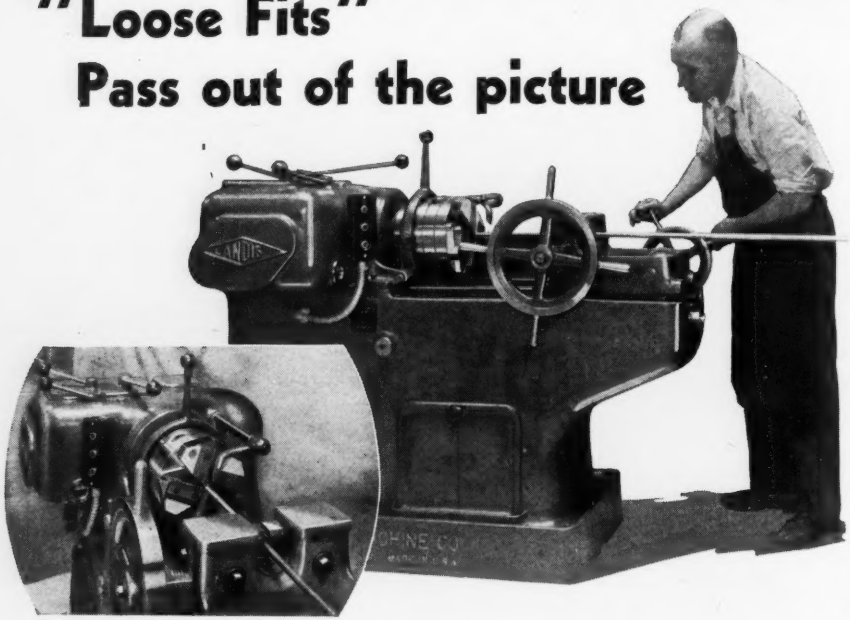

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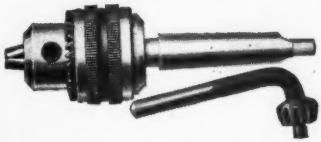

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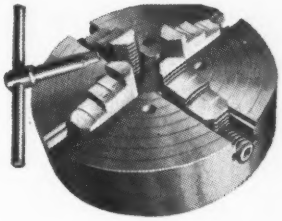

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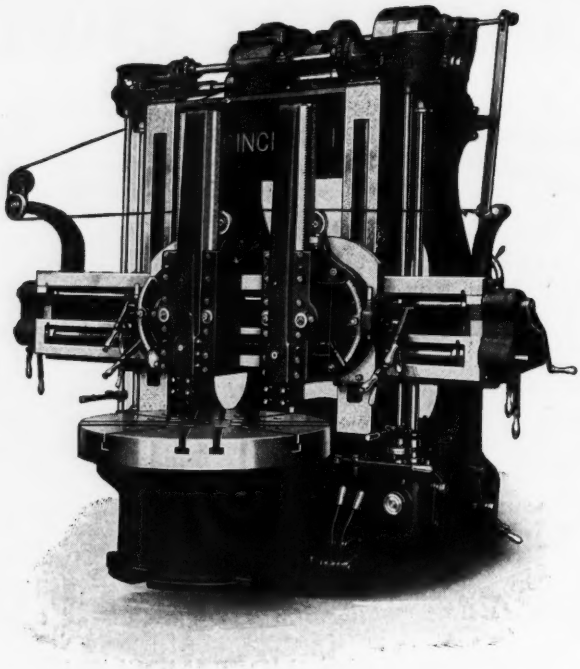

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MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 5 MAY, 1933 Number 12

A Magazine for Machine Shop Executives

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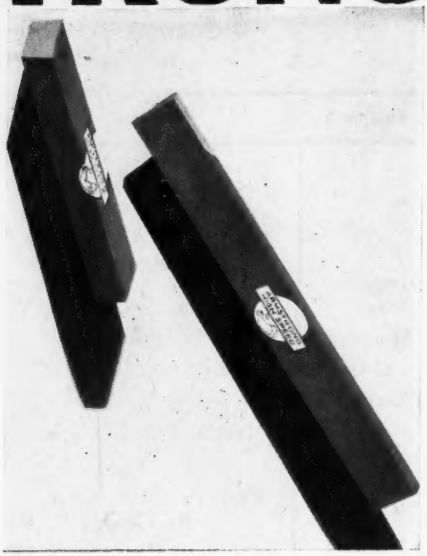

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MODERN Machine Shop

CINCINNATI, OHIO — MAY, 1933 — VOL. 5, NO. 12

Planning the Modern Plant

BY E. C. BRANDT
Westinghouse Electric & Mfg. Co.

THE plant planning engineer has at last come into his own, not only in the large shop, but also in the small shop; not only in the new shop, but also in the old one in which, as the methods of manufacturing have changed in keeping with changes and improvements in the design of the product, equipment has been added or discarded from time to time.

In past decades the plant manager who found it necessary to increase his plant capacity ordered a machine and then looked for an available space in the plant in which to set it. Any queries as to the cost of handling materials to and from the machine were dismissed on the ground that the wages of a trucker were low and therefore the cost of moving the materials would also be low. The modern plant manager has learned that the cost of moving materials is, in the aggregate, a very sizeable part of the cost of operation, consequently each new piece of equipment must be placed in the position most advantageous for the operation for which it was purchased and intended.

Regardless of the size of the shop —large or small—it is advisable for the plant manager to have a floor plan of the shop upon which are traced the flow of the materials that enter into the construction of the product. The plan shown here illustrates the manner in which a layout was made for the production of electric motors for railway electrification. Without pre-planning, laying out, and studying the requirements for material storage and the fabricating, machining and assembling operations, it would have been impossible to utilize the available floor space to best advantage.

The point of over-expansion of facilities has been stressed so thoroughly in recent months, and the necessity for economy is going to be so great for some time to come, that plans for additional space are going to be studied and re-studied before any expansion is approved in the near future. Even with production at its present low stage, the plant owner or manager would find an advantage in having a plan of his production flow and making a close study of it. Indeed, he would probably not only find it possible to arrange his present equipment in less space and thus prepare for future expansion, but the increased facilities might make it possible for him to take on additional lines of manufacturing at no addi-

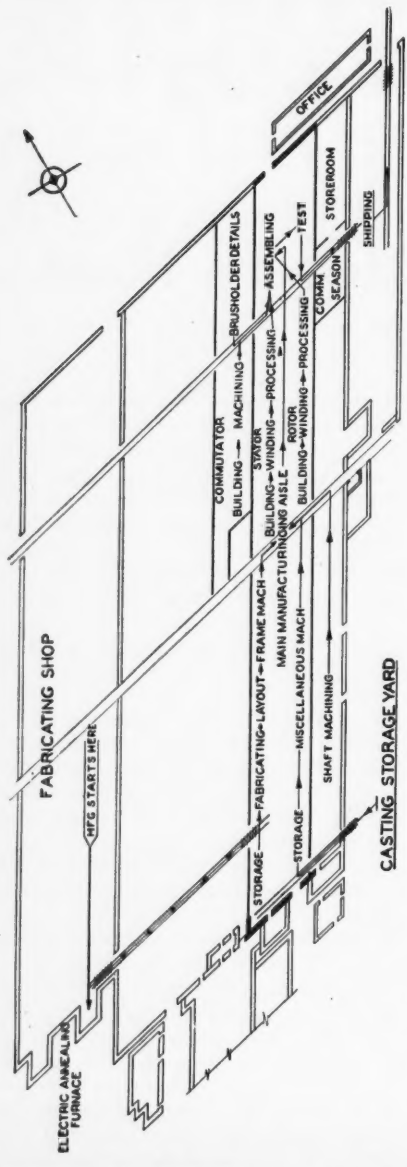


Diagram showing production flow in department producing electric motors for railway electrification.

tional expense for factory room.

It is not uncommon to find, when a new manufacturing layout is made and the machinery is placed in sequence of operation so as to decrease handling time and minimize the amount of material in progress, that a saving of from 50 to 60 per cent of the space formerly used has been made.

A floor plan layout showing the production flow is of particular advantage to the small shop where a diversity of products are to be manufactured. The layout man or plant engineer should make a plan of the different types of operations required on the different products, such as milling, grinding, planing, drilling, material storage, final assembly, and so on. It may be found that the operations are so diversified that it would be better to group the machines according to classification of operations rather than sequence.

In other words, it might be that the milling machines should be placed together, the drill presses and tapping machines should be grouped, the lathes, profilers, and screw machines should be placed together, and so on. Then up-to-date belt or roller conveyor systems to the central feeder storeroom, with remote control, should be provided. Where castings and other materials are of such a nature that they cannot be handled on belt or roller conveyors, they should be conveyed in tote boxes or on skids and after each process operation should be returned to one central location and redistributed to the next following operations. By this method the labor required for material handling can be greatly reduced, if not entirly eliminated.

Where the above suggestions are followed it will be found that the constant checking and re-checking by production dispatchers, with frequent intensive searches for misplaced lots

of parts, will also be eliminated. In a plant that is properly laid out, with the most efficient methods of handling materials, one dispatcher is usually all that is necessary and he may be dispensed with altogether.

Careful plant planning makes possible the elimination of all unnecessary overhead belts, countershafts, pulleys, and so on, greatly reducing operating and maintenance costs. Maintenance work, oiling, and cleaning which has to be done on scaffolds or ladders is at least 50 per cent more costly than the same work where motors and other equipment are so arranged that the maintenance men can work on the floor. The available light is increased, better ventilation is provided, and better working conditions result all around, resulting in reduced costs.

This same objective as regards economy of operation and maintenance can be attained where the production warrants the placing of machinery according to sequence of operation, as in straight line production. But for the small shop where the products are of a diversified nature, the mobilization of machine tools and equipment by groups of machines with the power and remote control conveyors from one central station has proved the most economical.

The service that has been rendered to industry by the conveyor manufacturers is worthy of mention in any article pertaining to plant planning. It has been largely due to their efforts and studies that the cost of material handling and processing has been greatly reduced, an untold number of accidents have been prevented, and a vast amount of drudgery has been eliminated.

I believe it is going to be only through taking recognizance of the advisability of laying out definite plans and by making layouts and studying the intangible costs which enter into the manufacturing costs of their products that many of our American manufacturers are going to be able to meet competition and continue in business. It is a foregone conclusion that competition will be keener than ever as business resumes.

Manufacturing costs include a number of expenses, aside from direct labor, which must be carefully analyzed and anticipated at all times if waste is to be avoided and costs are to be kept at the minimum. Following is a list of the more important of these cost items and the manner in which they are affected by careful planning and efficient plant layout.

Departmental Supervision. The amount of departmental supervision necessary is substantially reduced as a result of the use of proper conveying equipment. Materials are automatically moved from one machine or operation to another, eliminating the necessity for personal supervision of routing and trucking.

Clerical Labor. Record-keeping and stock-chasing is minimized as a result of the routing of materials through a central storeroom from which the materials are distributed to subsequent operations.

Storeroom Labor. A large part of the labor required to handle and rehandle materials can be dispensed with through the use of containers which serve as storage receptacles as well as for use in transporting, thus eliminating the time and labor required to handle the materials into and out of storage bins.

Defective Workmanship. Losses through defective workmanship are materially reduced through process inspection as the parts are conveyed into the central storeroom. Inspection after each machining operation prevents subsequent operations being performed on defective work, with additional losses in labor costs.

Material Losses. The immediate and automatic movement of materials that have been processed makes it impossible for parts to be left on the floor or piled in containers from which they may be lost. Shortages are immediately discovered and traced.

Inventories. The immediate movement of materials by conveyor eliminates necessity for an accumulation of stock at each operation-point, thus reducing inventories to the minimum. Capital otherwise tied up in materials is released, waste and loss of materials are prevented, floor space otherwise used for storage is utilized, machine operators' time is employed to better advantage by convenient arrangement of the conveyors, production is increased by having the materials delivered to the working station of the operator, and manufacturing costs are reduced.

Power Costs. Where modern self-contained motorized equipment is used, the power required is reduced to the minimum, because only the machines and equipment actually in use require power. This point is of special importance when production is at a low ebb. There is hardly a shop at the present time that has more than a small part of its equipment in operation. Instead of operating a 50 h. p. motor to drive an entire group of machines, a few individual 5 h. p. motors are providing all the power necessary. The advantages of individual motor drive form another story; sufficient to say here that the expense of rearranging equipment to meet the ever-changing conditions of modern production is greatly reduced by the ease with which a machine can be disconnected and moved from one location to another, either for rearrangement of production lines or for repair.

Maintenance. Where modern equipment is used, the cost of maintenance is brought to the minimum, With individually motor-driven equipment the necessity for slings, ladders, hoists, scaffolds, and so on is eliminated, and the accidents to men and equipment which frequently resulted from overhead work are done away with. The labor and expense required to keep countershafts oiled and in repair and for taking down and re-hanging countershafts when machines are moved can almost be eliminated as, once the connections have been installed for motor drive, only a few minutes are required to disconnect and connect a machine to the power lines. The time required to oil and clean a motor on the floor or mounted as an integral part of a machine is negligible compared to the time necessary to oil and clean an overhead line shaft and the countershafts.

Lighting Equipment. The wiring for light equipment is laid out in straight lines and the junction boxes, connections, conduits, and so on are not promiscuously scattered through overhead obstructions. The cost of maintaining and cleaning reflectors and bulbs is reduced in some cases as much as 75 per cent as a result of the improved surrounding conditions.

Heating, ventilating, and other piping. Pipes can be laid in straight lines with practically the same advantages as for the conduit. Ventilating equipment, especially, is more easily installed and maintained.

Rentals and taxes. These items are reduced as a result of the increased productive capacity per square foot and of the lighter building construction permissible where there are no overhead vibrating weights. Building depreciation is also reduced for the same reason.

Fire Insurance. The cost of insurance is reduced because most of the fire hazards are eliminated. Greasy overhead belts, pulleys, and the accumulation of greasy waste which is to

be found in many plants have always been considered a serious fire hazard.

Accident compensation. The possibilities of injury are reduced to the minimum, especially those injuries to the feet and legs which are so outstanding in the national accident reports. With no piles of materials filling all available floor space, injuries resulting from accidently tipping the piles over, or from their jarring loose and falling, or as a result of stumbling over them are eliminated.

Welfare. This item constitutes an important part of any modern productive scheme. Improved lighting, heating, and ventilating, cleaner and more cheerful working conditions, and a consideration of the human element in laying out the production schedule all result in better working conditions and more contentment and satisfaction among the workers.

Sheets of plain transparent Cellophane are now being used between mechanical units with lacquer finish, when such units are piled one on another in the stock-room, to prevent the finish from being marred. The Cellophane pulls free from the finish without leaving imprint, impression, or fuzz.

Welding Defective Work Without Removing From Machine

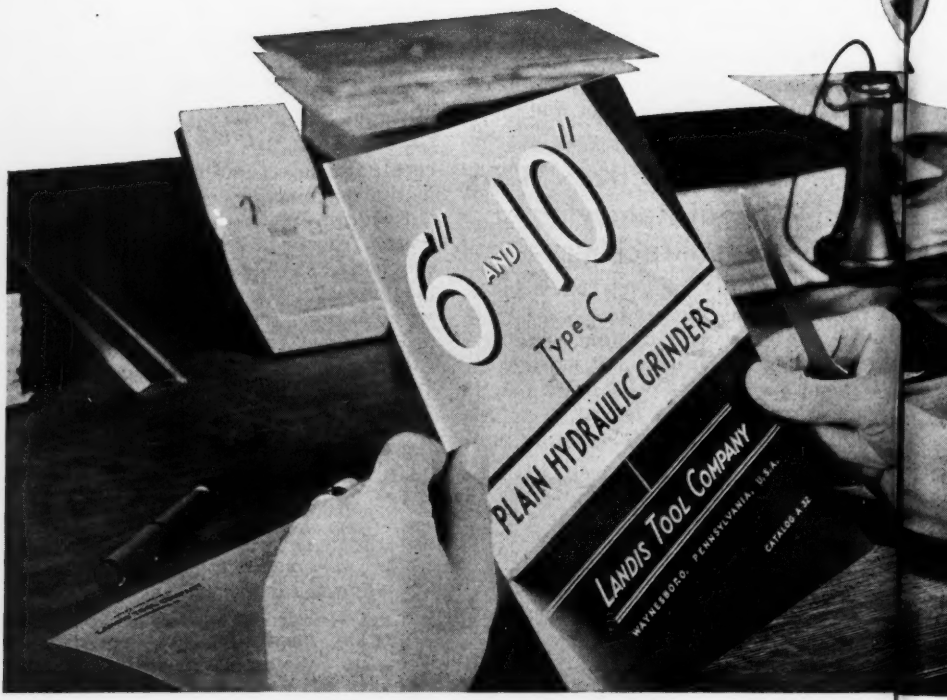
IT occasionally happens that a blowhole or other defect in a steel casting will be brought to light while the casting is in process of machining. When this happens on a finish cut, it is a very expensive operation to remove the casting from the boring mill, repair the defect and reset the casting in the machine. Instead, at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company, a welder is called to the machine and the casting is repaired without removing it from the fixture.

The time required to repair the casting shown on the boring mill in the illustration was ten minutes, This casting is nearly 45 inches in diameter and weighs approximately 1500 pounds. The diameter of the finished bore must be within the limits of 17.000—17.003 inches.

Casting defects uncovered while in process of machining are electrically welded at the machine.

The savings effected by welding the defect included the original cost of the casting, plus one and one-half hours for setting up the casting in the mill, plus two hours machining time. The additional saving effected by welding the piece at the machine instead of removing it and sending it to the welding shop included three and one-half hours time which would have been required to remove the casting from the mill, set it up again in the mill, and true it with an indicator.

DO AS THIS MAN



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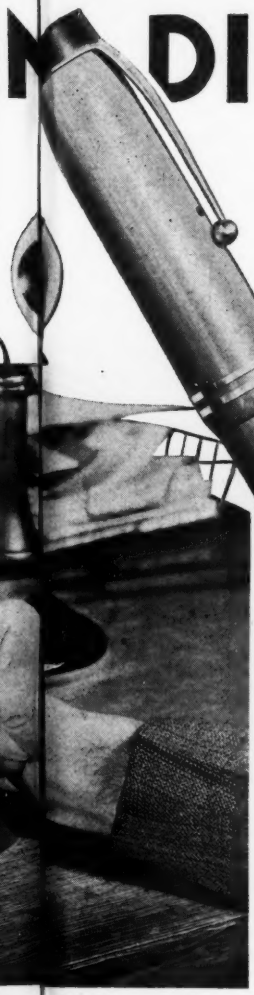

This wide awake executive is always interested in new equipment. Even though he knows of no immediate need, he acquaints himself with all that is new in machine tools. Often this develops into the first step leading toward a cost reducing replacement.

As portrayed here he is investigating the possibilities of the new Landis Type C 6" and 10" Plain Hydraulic Grinders. Turning from page to page of the catalog he cannot help but be impressed by the neat, compact appearance of the machines. Yet they certainly have power and weight; both, exactly where needed. Views and specifications prove that. When he notices how convenient they are to operate and inspect he will naturally conclude that here is a type of grinder so economical to use that eventually he cannot afford NOT to have one or more in his plant.

Catalog No. A-32 contains the whole interesting story. Why not do as this man did? Get a copy by filling in the coupon.

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Service Carts for Gas Welders

By James M. Vossler
Welding Supervisor, Southern Pacific Lines,
Houston, Texas

In large shops, especially railway repair shops, where oxygen and acetylene are piped through the entire shop, it is easy to care for the equipment used by the torch operators who are stationed in permanent locations. With the torch operators whose duties require them to move their equipment from job to job throughout the shops, quite a different problem is presented. Protection must be provided to prevent the equipment—particularly the regulators—from being damaged in moving. Rough handling of regulators causes the nozzle seats to be damaged, resulting in leakage of the gases at the nozzle. The carrying of cutting and welding tips in pockets or loose in boxes damages the seats, resulting in leaks.

In the interest of economy, torch operators should have all necessary equipment and supplies that they ordinarily need on the job with them, and such equipment should be well protected. It is a waste of time for a welder to have to go to the toolroom or tool locker for every different tip or other tool that is needed.

To avoid this waste of time, the tool cart shown in Fig. 1 was designed. The cart serves, for all practical purposes, as a portable tool locker. Figure 1 shows the cart closed and ready for transportation, and in Fig. 2 the same cart is shown open and ready for operation. In designing the cart, considerable thought was given to the protection of the regulators. Since the equipment was intended for use in connection with a medium pressure acetylene system, it was considered necessary for best torch operation to have regulators on both the ecetylene and the oxygen, and it was decided that the best protection would be afforded the regulators by mounting them premanently in the tool locker of the cart.

Fig. 1—Service Cart or Portable Locker for Welders.

Fittings for the support of the regulators and for supplying the gases to them were designed, as shown in the drawing Fig. 3, and mounted on the side of the locker as shown in Fig. 1. Standard oxygen and acetylene regulator outlet bushings were screwed into the inlet side of these fittings to receive standard hose connections. To the other end of this hose was attached the special hose connections shown

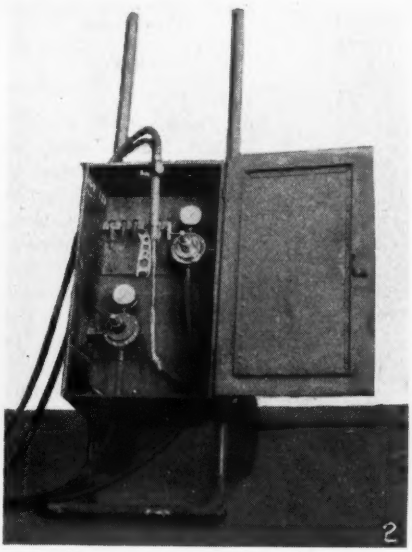


Fig. 2—Locker Opened, Showing Interior and Equipment.

in Fig. 4. It will be noted that the acetylene hose connection has the same thread and seat as a standard "commercial" acetylene regulator inlet connection, and that the oxygen hose connection has the same thread and seat as the standard oxygen regulator inlet connection thread and seat.

These hose connections are for attaching the hose to oxygen and acetylene supply stations, and are designed as described above so that they might connect to station fittings which were designed to receive regulators whose inlet connections are of the same thread. The regulators are mounted in the tool locker of the cart on the projections of the fittings shown in Fig. 3, which extend inside the locker. From the outlet connections of the regulators, fifty feet of hose extends through properly-bushed holes in the bottom of the locker and thence to the torch.

As will be seen in Fig. 2, a rack is provided in the rear of the locker upon which to hang the tips. It will

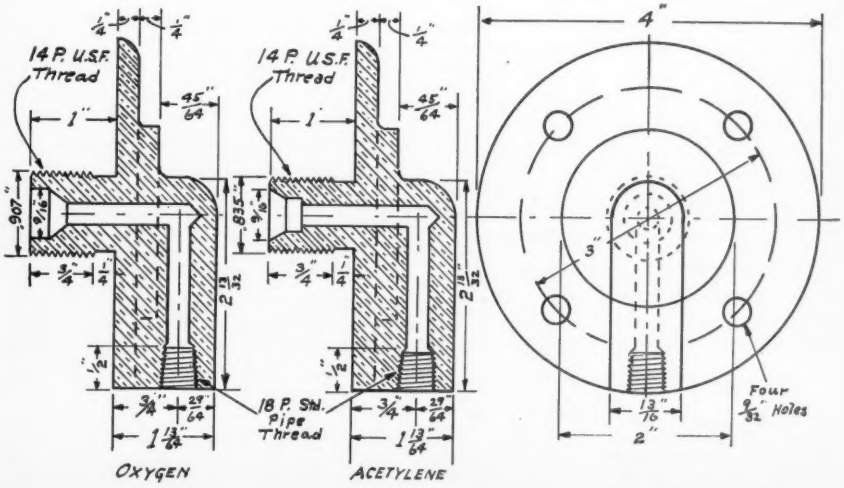


Fig. 3—These fittings serve as inlets for the gases and also act as supports for the regulators.

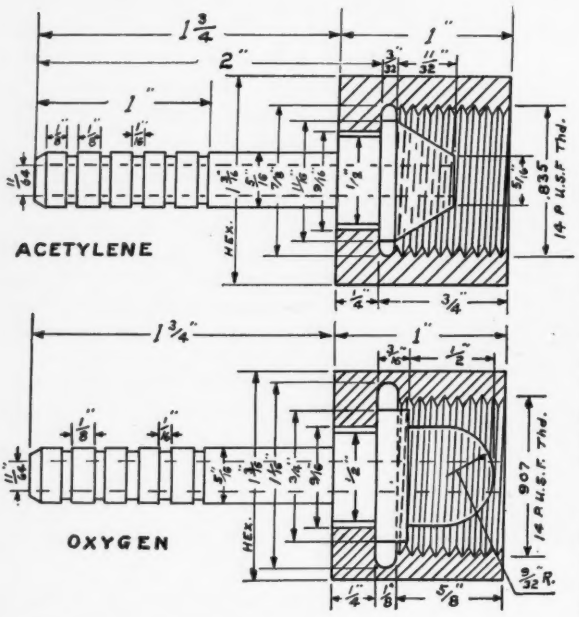


Fig. 4—Drawing of Gas Hose Connections.

provided with a substantial lock, and at night the equipment is locked in and the outfit left at the job location.

When it is necessary to move the equipment, the station hose is wrapped around the handles as shown in Fig. 1 and the torch hose is wrapped around the locker. With all equipment, the cart is light and easily moved.

In Fig. 6 will be seen a cart made for transporting oxygen and acetylene tanks, as well as a tool locker containing the operating equipment. Bronze tubing of sufficient strength to withstand tank pressures extends from the tanks to the regulator receiving fittings. Copper tubing cannot be used for the purpose, however, due to a well-known chemical action that takes place between copper and acetylene.

In the rear of the cart is a tool locker of sufficient size to contain all

be noted that the regulators are not in line with each other, the difference in height being made so that the regulators would not interfere with each other in case it was decided at any future time to use a make of regulator that was too large to admit of placing side by side.

The wheels of the truck are of welded construction, the rims being ⅜-in. material, 1¾ in. wide, and formed to 15½ in. diameter as shown in Fig. 5, and the flanges of ¼-in. plate. The door is

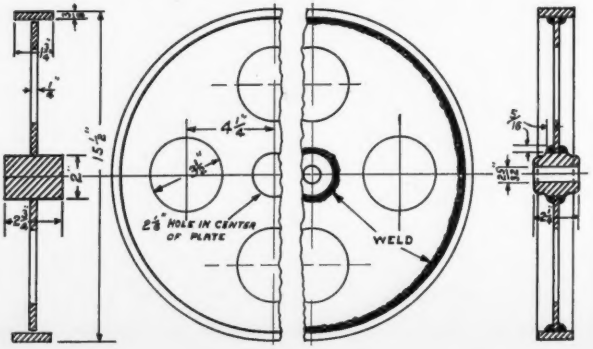
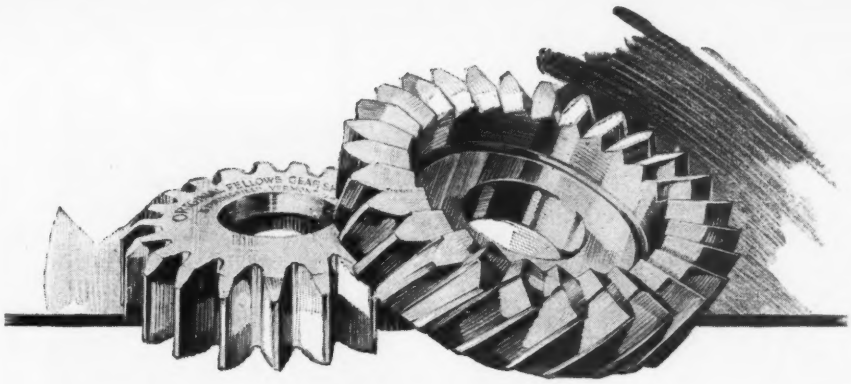


Fig. 5—Drawing showing design of truck wheel. The wheel assembled for welding is shown at the left, and at the right is a cross section of the finished wheel.



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~ GEAR SHAPERS ~

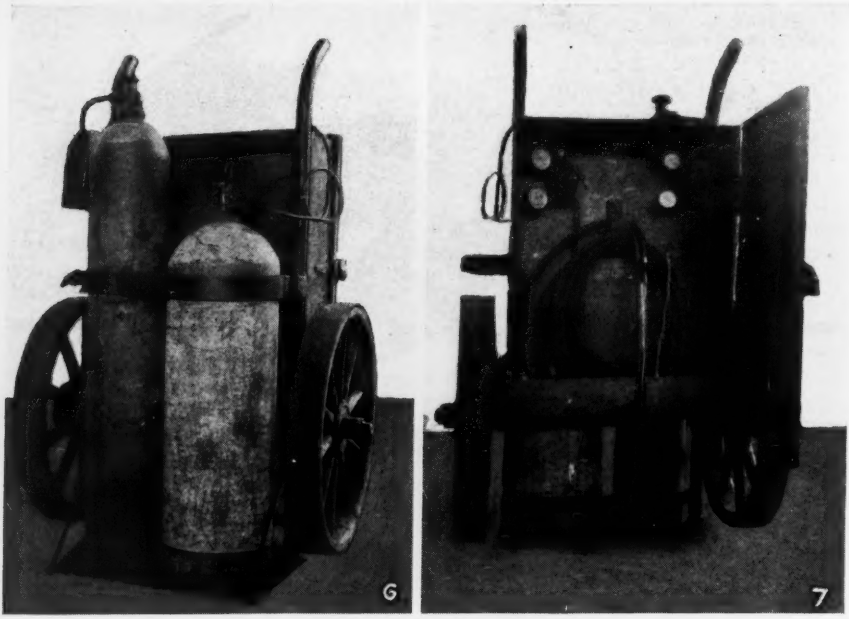

Fig. 6—Cart for Transporting Oxygen and Acetylene Tanks, in Addition to Welding Operator's Tools. Fig. 7—Interior of Locker.

the operator's equipment, as well as the hose. The inside of the locker is shown in Fig. 7. For convenience, the regulator support castings are mounted in the top of the locker. When it is desired, all equipment can also be locked inside. In making lockers similar to those described here, one point should not be overlooked; ample ventilation must be provided to prevent an accumulation of gas should a leak occur.

You Can Save on Your Electric Power Costs

There are very few plants using electric power in which the cost of that power cannot be reduced, according to a booklet put out by The Condenser Corporation of America, 261 Cornelison Ave., Jersey City, N. J. The booklet says "Loads may be reduced in a number of ways, depending upon local conditions in the plant. In melting furnaces, heat treating and annealing furnaces, enameling and japanning ovens, core baking ovens, and many other kinds of equipment in which electric heat is used, the current may be controlled so that it will automatically be reduced or interrupted with little or no loss in temperature and no loss in production."

The controller is an electrical device which automatically limits the peak load to a predetermined amount and thus reduces the "maximum demand" which is used by the power companies for billing purposes. It is connected to the main incoming power line through the necessary metering transformers, although it is not a meter; it is a controlling device. It is set for the desired "maximum demand", and when the demand reaches that point, the controller functions so as to reduce the load and holds the demand with the predetermined maximum.

The plant engineer or managing executive can obtain a copy of the booklet by writing to the firm at the above address and asking for the "Acracon Power Demand Controller" booklet.

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PIONEERS IN SPECIALIZED LUBRICATION FOR INDUSTRY

New Plan of Apprenticeship at Forbes and Myers

By A. W. Forbes, *President*
Forbes & Myers, Worcester, Mass.

The future of the time-honored apprenticeship system is in the balance. With industry still in the convalescent stage and changes rapidly following each other, what form the apprentice training of the future will take is a matter for conjecture. A well-known manufacturer tells here what his own firm is doing along this line.

OUR apprenticeship system was started during the war and saw its greatest development during the year 1920. Since then it has been continued to the extent that seemed advisable under existing business conditions until the engagement of our last apprentices, which was in 1928. Our observations—which agreed with the observations in other plants—that the more recent apprentices did not do so well as the earlier apprentices have brought about some study and the development of plans for raising the standard of accomplishment.

We have identified two reasons for this decline in accomplishment, both of which originate in conditions that have no connection with the shop, but both of which require consideration by those who are responsible for the successful operation of the apprenticeship system. The two reasons are that (1) the grade of boy applying for apprenticeship today is inferior to the grade of boy available in former years, and that (2) public sentiment toward apprenticeship has so altered that the boy is less likely to take a favorable attitude toward his apprenticeship.

We refuse to believe that either of these reasons is of sufficient importance to warrant abandonment of the idea of apprenticeship, but they require us to exercise much greater care than formerly in the selection and guidance of apprentices. The methods we used in 1920 will not prove successful today.

The first problem is to find apprentices whose qualifications meet our requirements. A simple advertisement is useless, as it draws a lot of applicants who are entirely unfitted or unsuited to our needs but upon whom a lot of time must be spent in examination. It will mean hopes and disappointments on the part of the boys, and will probably result in 100 per cent rejections. The reason for this fact is that the only type of boy who is looking for apprenticeship today is a type of boy who will not make good. As a rule, he is looking for an escape from study and is rejecting school for that reason. He wants someone to perform the impossible task of making him skilled without his having to learn. Others are boys who are out of work and who turn to apprenticeship as the last

resort in finding a job. Neither of these types can be accepted.

Today it is useless to expect voluntary applications for apprenticeship. Boys of the right kind must be sought through whatever agencies may be available. However, before deciding upon the kind of boy wanted, it is necessary to decide upon the type of job for which it is proposed to train the boy. We have no desire to train ordinary machinists or machine operators. The trade schools want that job, and they are turning out a larger supply than is needed. There is no object in apprenticeship—so far as we are concerned—except to produce a superior type of employee to that furnished by the vocational schools.

We want to develop only men who are capable of assuming a moderate amount of executive responsibility. There is nothing to prevent the boys from advancing through their apprenticeships to the highest executive positions, but—leaving ultimate aims aside—there are three main functions for which apprentices are desired. These are (1) Management, starting with foremanship, (2) Design, both for the purpose of improving existing products and for the development of new products to meet the requirements of our customers, and (3) Sales, which in our case is closely related to manufacture and design.

Each of these fields requires men of a distinctly higher caliber and much greater capabilities than those of the ordinary factory worker. To be able to fit naturally into the positions for which they are intended, each boy selected must possess what might be called a spirit of aristocracy—a conviction that he is fitted for something better than the ordinary tasks of life, and a determination to work for the ultimate goal. That does not mean that the boy should have snobbish tendencies; a friendly mixer will do better than the solitary type of person. But it **does** mean that he should be superior in character and understanding to the ordinary worker, and that he should realize this superiority.

When he it put to work with a man who has worked at a trade for twenty-five years, he should try to learn what he can from him, but at the same time he should realize that the reason for the workman's having been twenty-five years on that job is that he lacked some quality essential to advancement. He should look upon such a man both as an ideal and as a bad example; as an ideal because of his ability to perform his given tasks well, but as a bad example because of his inability to surmount the obstacles that prevented promotion.

It might be thought that this feeling of "aristocracy" would cause friction in the shop, but as a matter of fact it does not. We have placed superior boys from high-grade families among the men in the shop, and these men have recognized the superior quality of the boys without knowing anything about their origin. These boys work temporarily at tasks which they would never for a minute consider as their life work. They come with full confidence that they are of a superior class to that of the ordinary factory worker, and yet, as a general thing, they are more popular among the workmen than the boys of the worker class. What causes friction is for a person of low-grade character to try to act the part of an aristocrate

It is not expected that suitable candidates for apprenticeship will be found among the working classes, although there are exceptions to this rule. The older worker of today has, in most cases, adopted an attitude of resignation toward his trade and toward his position in life. Finding

himself still at the bench or machine after many years in the shop, he accepts his position in the social and economic scale as his fate and feels that any extra effort on his part is useless. As a general thing the sons are like the parents, and even if naturally of superior character or capabilities, the social attitude of the parents is likely to be reflected in their children.

We would like to obtain our apprentices from the best families in the community, but have very little hope of doing so. It has been our experience that the best source of material is broken homes. The boy whose father's life has been cursed by drink, or drugs, or even by crime, may have inherited good traits without the particular vices which kept the family down. I have seen boys survive home conditions which, it would seem, would wreck any character, without apparently suffering from the experience. Their native ambition, character and self respect were all of high grade.

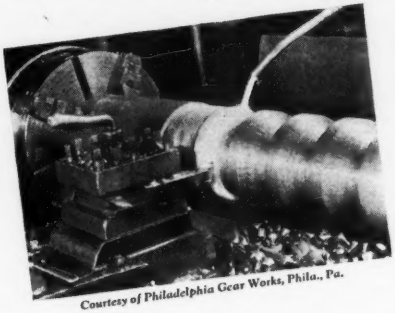
The general attiude toward apprenticeship during late years has been such as to make the selection of apprentices of prime importance. Apprenticeship—the opportunity to become master of a trade and to build a foundation for future growth—cannot be offered to the masses unless the masses are ready for it. It must be offered to the select few, and then if these few show exceptional progress, it can be offered to a greater number. It can readily be seen, from the foregoing, that we regard the selection of the apprentice as the most important factor in apprentice training.

Having gone to some lengths to select a boy with just the right qualities, it would be folly to risk spoiling those qualities by placing the boy under the tutelage of a workman whose attitude was of the wrong kind. If the apprentice is to receive instruction and training from one of the workmen in the shop, care should be taken to see that the workman has the right attitude toward his job and toward the company. In our shop no apprentice is placed under the direction of a workman except temporarily, as I retain full supervision over the apprentices. They work with the other employees and are expected to cooperate with them, but are not made subordinate to them.

Whatever the ultimate aim of each apprentice, the start will be the same. He will be given responsibility for some simple operation which has not been standardized. While doing the work himself, and perhaps afterward with one or more assistants, he is to handle it from the point of view of the management. Tools and fixtures may have to be made, or an opportunity will be presented to substitute better tools for those in use.

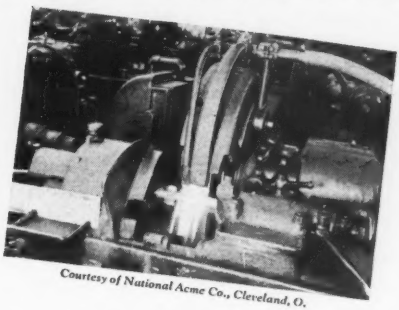
In considering the design of new tools or improvements on existing tools, a certain amount of judgment as to quality and cost will be required. Such work may seem rather advanced for a first-year apprentice, but some judgment must, of course, be used in assigning the work. There are simple processes on simple parts for which simple tools and fixtures are used, the design of which is easily within the mental capacity of a boy of ten years. More complex problems should be withheld until later.

The course to be followed will be planned with two principles in mind. First, a continuous progressive route will be followed from the first job assigned to the ultimate advanced position in management, design or sales. The advance is to be continuous and without retrogression, avoiding the backward steps which are necessary when transfers are made from one department to another. Second, the course will include concise, but com-



Courtesy of Philadelphia Gear Works, Phila., Pa.

OPERATION: TURNING GEAR BLANK.
MACHINE: LIBBY LATHE.
MATERIAL: STEEL FORGING.
CUT: 7/8 INCH. **FEED:** 1/32 INCH.
LUBRICANT: 1 PART SUNOCO TO 15 PARTS WATER.



Courtesy of National Acme Co., Cleveland, O.

OPERATION: GRINDING TWO DIAMETERS.
MACHINE. BROWN & SHARPE NO. 30.
MATERIAL: TYPE EE STEEL FORGING.
WHEEL: 30 X 28 X 4 INCHES, R. P. M. 900.
COOLANT: 1 PART SUNOCO TO 40 PARTS WATER.

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Consider the increased speed and feeds permissible with Sunoco, the number of pieces per tool grind, the cost of tool maintenance and the accuracy and finish obtained throughout a long run. In addition, Sunoco will protect the finished parts from rust and corrosion.

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British Sun Oil Co., Ltd., London, Eng.

prehensive, instruction and practice in each of the main divisions of the business. The coordination of these two principles may seem impossible, but it is not as difficult as might be expected. There is an inter-relation between all departments of the work that ties them together in many places. For instance, it is impossible to design a machine without considering both the needs of the customer and the manufacturing methods of the plant. When the apprentice arrives at the need for such knowledge he will be given practice in the field, and yet it is in direct line towards his particular goal.

Most important of all, however, is the effort that will be made to keep the spontaneous initiative of youth alive throughout the program. Upon such initiative is progress built. It must be under control, but the control will take the form of direction along lines that meet the needs of the business. There will be none of the type of control that stifles enthusiasm and tends to reduce the thinking processes of a human being to those of a machine. There will be cooperation with its necessary subordination, but not the routine, deadening discipline of mass production or of schools.

"Short-Run" Stamping Process Defined

THE nation-wide interest in the making of metal stampings by the so-called "short-run process," stimulated, no doubt, by the constant pressure for lower costs, has resulted in some confusion as to just what "short-run" means. One large producer of short-run stampings, the Detroit Stamping Company, of Detroit, Michigan, offers a definition of its own.

"In defining the term 'short-run stamping process'," states Glendon H. Roberts, president of the Detroit concern, "please bear in mind that our company has been making permanent dies and fabricating stampings for many years. Our short-run process is an additional service of recent origin but closely related to our volume production work.

"Our short-run process of making stampings involves not only a new method of die design, but as well the type of materials used in the tools, method of hardening the dies, and special equipment in our press department.

"With our short-run process the results are equal in every detail to permanent die work. As a matter of fact, the blanked edge may be slightly more free of burrs when this process is used. We make short-run stampings of any material, of any temper, up to ⅜-in. in thickness.

"Briefly, we think the term 'short-run' means exactly what it says—small lots (from 100 to 2000) of stampings of any material, up to ⅜-in. in thickness; not different in accuracy, temper or any other needed quality from stampings made from permanent tools. Our process permits production quantities of 10,000 parts, but it may be more economical to make production dies for such volume.

"We believe the trade expects these things from the short-run stamping process and any process or method that fails to meet these standards perhaps should be designated by other terms. We found it necessary to add a considerable amount of special equipment to our die and press departments and to draw heavily upon our 18 years of experience in order to make short-run stampings of the quality demanded by the trade in general."

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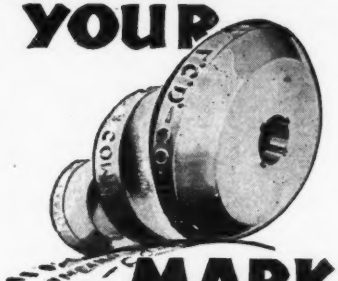

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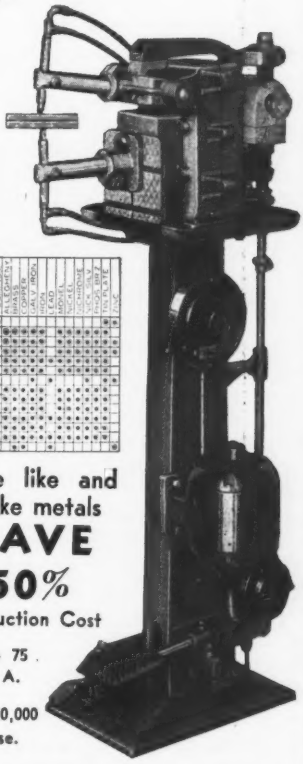

METAL	ALUMINUM	ALLEGHENY	BRASS	COPPER	GALV. IRON	IRON	LEAD	MONEL	NICKEL	NICHROME	NICK. SIL.	PHOS. BRZ.	TIN PLATE	ZINC
ALUMINUM	●												●	
ALLEGHENY		●	●	●	●	●		●	●	●	●	●	●	●
BRASS		●	●	●	●	●		●	●	●	●	●	●	●
COPPER		●	●	●	●	●		●	●	●	●	●	●	●
GALV. IRON		●	●	●	●	●		●	●	●	●	●	●	●
IRON		●	●	●	●	●		●	●	●	●	●	●	●
LEAD							●						●	
MONEL		●	●	●	●	●		●	●	●	●	●	●	●
NICKEL		●	●	●	●	●		●	●	●	●	●	●	●
NICHROME		●	●	●	●	●		●	●	●	●	●	●	●
NICK. SIL.		●	●	●	●	●		●	●	●	●	●	●	●
PHOS. BRZ.		●	●	●	●	●		●	●	●	●	●	●	●
TIN PLATE	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ZINC		●	●	●	●	●		●	●	●	●	●	●	●

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The Indirect Cost of Accidents

By George P. Hutchins
Industrial Division, Elliott Service Company

THE experience of many years justifies the assertions; first, that work accidents are a form of waste and expense very largely under the control of management; second, that work accidents can be greatly reduced and very largely eliminated in practically every kind of industry by the application of tested methods; and third, that the cost of effective accident prevention is very low compared with the total direct and indirect cost of industrial accidents, and that systematic, continuous, organized safety work yields large profits, regardless of the social, moral and humanitarian responsibilities of management for the safety and health of its employees.

The direct cost of work accidents and accident insurance are readily calculated and generally known to every manager. The following indirect costs, while impossible to weigh and measure accurately, are recognized by all experts as an important part of accident expense and industrial waste. Their total is generally estimated to be as great as or greater than the direct costs:

1. Confusion and delay following every accident, commonly estimated by insurance men as costing not less than $10 per average accident.

2. Excessive expense for doctors, nurses and hospital service beyond the minimum of good experience.

3. Wages paid (as is often done) to injured employees during noncompensable period.

4. Production losses:

(a) From crews and gangs shorthanded through accidents.

(b) From idle machines of injured operators.

(c) From inefficiency and waste of new operators hired or transferred to replace the injured.

(d) From accidental damage to equipment. A substantial percentage of industrial injuries are either accompanied by, or caused by, costly damage to equipment, due to ignorance or disregard of safety.

(e) From reduced speed of operators on unguarded or dangerous machines. Skillful safety engineering generally increases work output and reduces spoilage by very substantial margins.

(f) Reduced efficiency from clearly psychological causes: **First:** Actual resentment among workers and breakdown of confidence, growing out of employer's failure to protect men from danger and injury, the workers feeling that "The boss don't give a damn." **Second:** Lack of teamwork spirit, interest and confidence which is developed by well organized safety work, and which **cannot be found where accidents are frequent.**

5. Turnover expense of injured men who have to be replaced, with the greater liability of new employees to injury.

6. Turnover of uninjured men through fear of accident. This fear is much greater than is commonly appreciated and reflects to a great de-

gree the anxieties of the workman's wife regarding his safety.

7. Greater trouble and cost of securing labor for hazardous work or in shops with bad accident records.

8. Obligation, often felt by employers, to carry on their payrolls or to pension men maimed in their service.

The cost of continuous, organized safety work capable of greatly reducing these heavy costs is but a fraction of these indirect accident losses, with the further gain of substantial reductions in compensation premiums. Experience has invariably proved, also that every thorough-going safety campaign reduces the danger of waste and spoilage and of fire losses, and is accompanied by a marked decrease in absenteeism due to illness—items of large cash value to every employer. Furthermore, safety is the "crux of the problem of better industrial relations," and the first step toward them.

The dollar side of safety and good personnel management is strikingly illustrated by the following summary of results achieved by thorough organization for safety in a Massachusetts mill, reported a few years ago in a management publication.

During the first year of operation under this plan the following are some of the results obtained:

"Labor turnover was reduced from 106 per cent to 42 per cent.

"Days lost from accidents were reduced from 704 days to 83 days.

"Compensation accident cases were reduced from 39 to 3.

"A reduction in lost time cases from sickness from 4,044 days to 1,209 days.

"Absenteeism from other sources was reduced from 9,737 days to 3,797 days.

"Discharges were reduced from 92 to 29 cases.

"A material rebate was secured from the insurance company as a result of the improved accident experience. During this period, production was nearly perfect, the percentage of poor work being only one tenth of one per cent of the goods produced.

These facts as quoted strikingly confirm the opening lines of this brief article that "work accidents are a form of waste and expense very largely under the control of management."

Buyer's Guide to Mechanical Rubber Goods

Designed to provide a wealth of information on rubber goods for industrial uses in convenient form, understandable alike to the engineer, purchasing agent and other plant executives, The Diamond Rubber Company, Inc., Akron, Ohio, has issued its new "Buyer's Guide to Mechanical Rubber Goods." The book contains 24 pages, packed with illustrations and data on many of the most widely used mechanical rubber products. It also lists standard stock sizes and list prices.

Among the most important sections are "Facts about Rubber Belts," describing construction, function and applications together with a data table making it easy to figure the type and size belt needed under given conditions: "Belts with Laminated Plies," and "Belts with Folded Plies", describing functions and applications of these two types.

"Directions for Ordering" describes information needed from a purchaser who is considering rubber belt use. The subject of conveyor belting and its many uses in varied industrial fields is covered with recommendations on applications. Elevator belting is similarly treated, with illustrated data making the subject easily understandable. "Facts About Hose" discusses construction, working and test pressures and includes a comprehensive table on "Loss in Pounds Pressure per 100 Feet of Hose". Hose for every type of industrial service is described.

All-rubber tubing, rubber packing, chute linings, pump valves, rubber matting, rubber cements, sponge rubber and a wide variety of other rubber products are described and pictured.

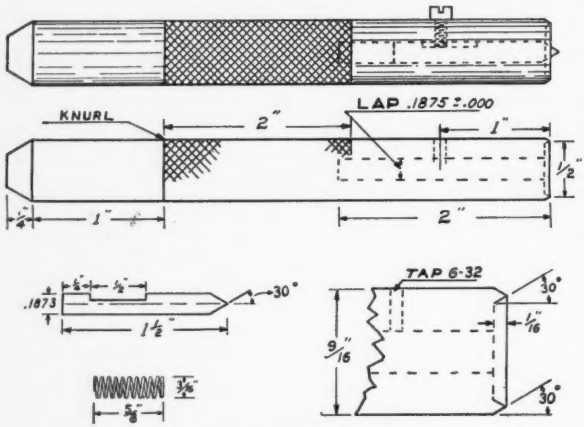
Copies of the "Buyer's Guide to Mechanical Rubber Goods" will be sent, gratis, to any plant executive.

IDEAS FROM READERS

A Useful Ring Punch

By F. J. Wilhelm

A RING punch such as that illustrated in the drawing herewith will save the toolmaker or layout man a large amount of time, especially on such work as section dies, where one has to use transfer screws or punch. When this point is reached, instead of circling the holes by the use of a divider, the toolmaker will find it much easier and quicker to set the plunger point into the center mark and inscribe a ring by striking the punch with the hammer. Care should be taken to set the punch firmly down on the surface of the work, and usually one light blow is all that is necessary to produce a good ring.



Drawing Showing Details of Ring Punch

In forming the ring on the end of the punch, care should be taken not to cut into the ring with the tool so as to leave an uneven ring. The plunger should be a sliding fit, tight enough to be almost a push fit and just loose enough so that the spring will force it outward. When the punch is set down on the work, the spring exerts sufficient pressure against the end of the plunger to force the point down into the center punch mark and thus keep the punch centered.

The punch should be hardened all over and drawn to a blue color except for the ring edge, which should be drawn to a light straw color. The best diameter for general purposes is ½ inch. However, the size should be governed by the general class of work upon which the punch is to be used.

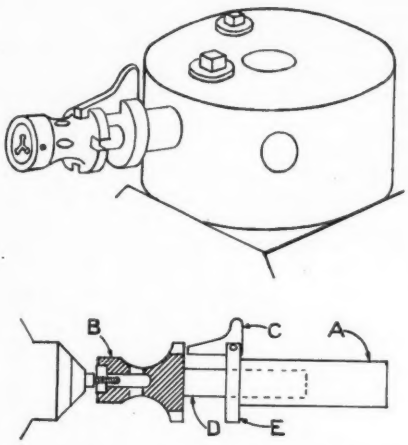
Simple Die Holder for Small Work

By Chas. L. Willey

RECENTLY we were obliged to make, on short notice, some several thousand small, shouldered studs with a very fine thread that was to be threaded close to the shoulder. The job was allotted to a Harkness bench turret lathe, for which we made the die holder shown in the illustration.

The complete tool consisted of three

parts: the shank A, the sliding section B, and the lock lever C. The shank A is bored to receive the sliding shaft D, which is integral with



Drawing Showing Design of Die Holder for Small Work

the holder. The collar E on the shank A is slotted and drilled to receive the lock lever C, which is hinged in position so that it will engage a corresponding slot in the rear end of the die holder B. The front end of the die holder is bored to a push fit for the die, and a screw is provided for locking the die in place. Holes are drilled in the holder to serve as an outlet for the chips.

In use, the turret stop is set to hold the turret in position so that, once the thread is started on the work, the thread will pull the die forward in the usual manner, the turret remaining stationary while the shaft D slides in the shank. The turret is positioned so that when the correct amount of thread has been cut, the rear end of the holder clears the lock lever C and the holder, together with the die, revolves with the work until the machine is stopped. The spindle is then reversed, the holder is gripped with the hand to hold it from revolving, and the die is backed off. The lock lever C is raised while the backing off is in process.

The light construction and free-releasing action of the holder eliminates danger of breaking the studs off at the shoulder, in spite of the fact that the threaded part is slender.

Auxiliary Arm and Extension for Vernier Height Gage

By W. F. James

THE vernier height gage is an exceedingly useful tool to have around a toolroom, but there are many times when the job of taking a measurement with the height gage could

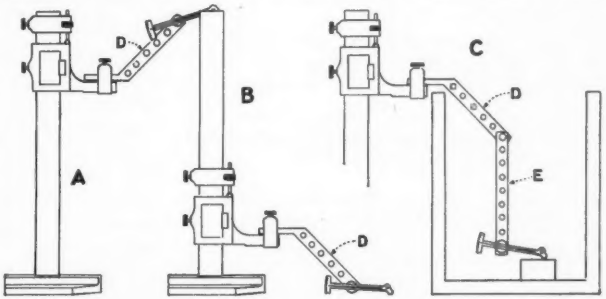


Fig. 1—Drawing showing some of the uses to which the extension can be put.

be simplified if one had an extension of the proper design. Such an extension is a part of my kit, and seems

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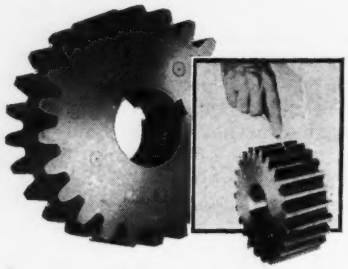

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to be so popular with my fellow-workmen that I am passing the design of it on for the benefit of others.

The extension consists of two pieces, hinged together with a thumb-nut. The auxiliary arm D can be used separately with the height gage to increase the range of the gage as shown at A in Fig. 1, or it can be used as shown at B, to obtain a

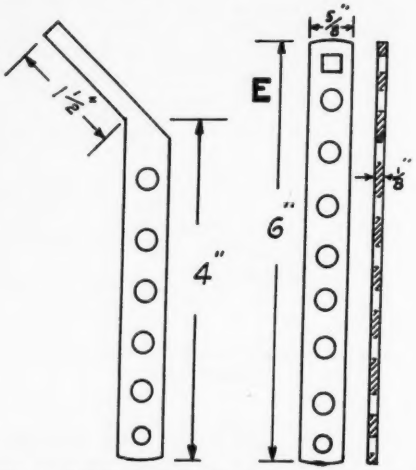


Fig. 2—Details of auxiliary arm and extension for vernier height gage.

dimension which is impossible with the straight arm. By combining the auxiliary arm D with the auxiliary arm extension E as shown at C, it is possible to reach into places that would be very difficult otherwise. In the case shown at C, the gage is being used to obtain a dimension inside of a jig, which is shown in cross-section.

Details of the extension are shown in Fig. 2. The two principal pieces are made of ⅛-in. flat steel, ⅝ in. wide. The auxiliary arm D has a shank ¼ in. in diameter, at an angle of 45 deg. from the arm proper. The arm can be attached to the gage in the usual manner, and can be set to

operate at any angle. A hole in the end of the arm provides for attaching either an indicator or the extension. The upper end of the extension has a square hole to take a corresponding square on the thumb screw, so that it can be locked with one hand. However, the extension can be swung to any angle from the arm, in the same plane, of course, as the arm. The round hole in the bottom ends of both the arm and the extension are made to fit the indicator nut. Other holes are drilled in the two pieces to lighten them.

A jig maker or tool inspector will find this extension well worth the time and cost of making.

An Emergency Keyway Cutter

By O. A. Smith

IT fell to my lot to re-cut a 3-in. keyway in a large steel gear after the keyway, which had become badly worn, had been built up with the aid of the electric welder. Our keyway cutting machine is a Mitts & Merrill No. 3, with a cutter capacity of 1½ in., which was large enough for practically any job that came into our shop. Consequently we had no 3-in. cutters on hand and found ourselves out of luck for a tool.

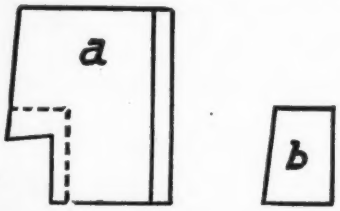
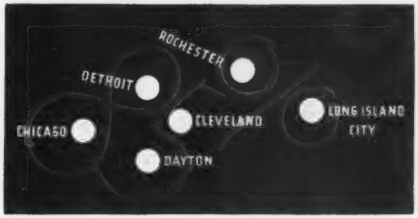


Fig. 1—(a) Showing how angle was machined in old keyway cutter. (b) End view of high speed steel toolbit, showing clearance.

There was only one quick method



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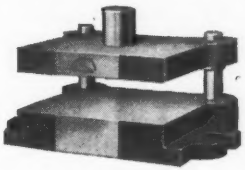

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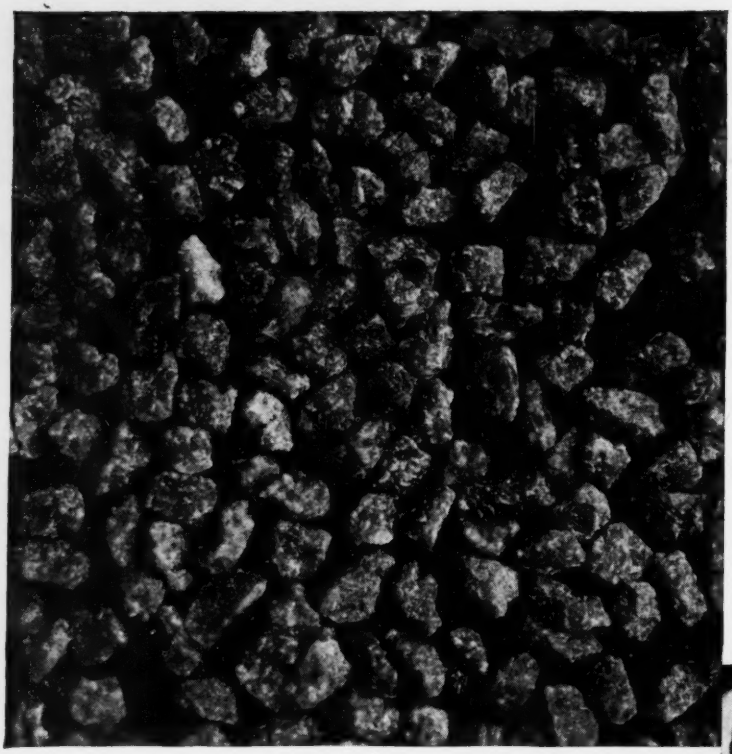

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of manufacturing the needed cutter, and that was to weld a piece of tool steel of the required width to a 1½-in. shank. I used an old, worn-out 1½-in. cutter, which I first annealed. Then I clamped it in the vise of the shaper and cut away the remnant of the old cutting edge to leave a square, clean angle as shown at A in Fig. 1. I then took a tool steel bit, ½x⅜x3 1/32 in., and ground one side to provide the required clearance as shown at B, Fig. 1. I polished the top and back of the cutted and electrically welded it into the angle of the shank, as illustrated in Fig. 2, and then ground the ends of the cutter central with the shank. The cutter worked perfectly, producing such a good job that I have since reclaimed all the old keyway cutters by tipping them with high speed steel bits in this manner.

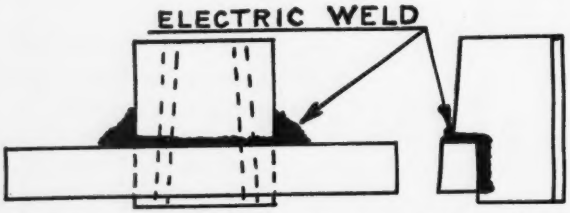


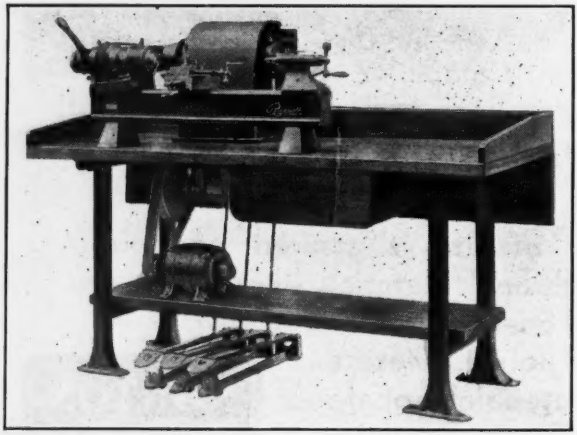
Fig. 2—Two views showing how high speed steel toolbit was welded to shank of old keyway cutter.

A Simple Way to Build Up a Pattern

By J. W. Greve

WHEN it becomes necessary to build up a pattern slightly, as

Rivett UNIT BENCH MOTOR DRIVE



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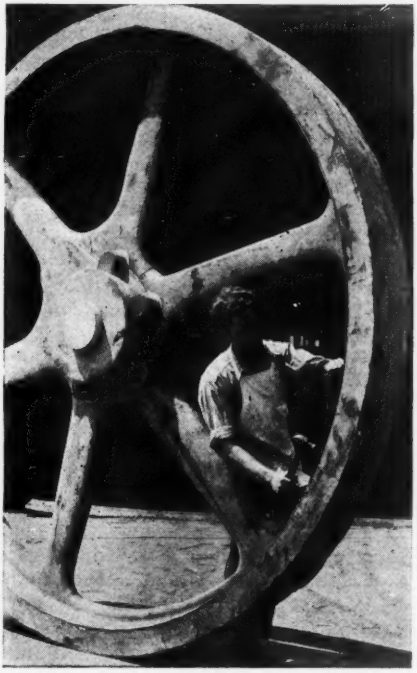
often happens, considerable time and expense may be saved by building up the pattern with linoleum to the required dimensions rather than to make a new pattern. Such changes become necessary, for example, when it is desired to cast steel from a pattern that was originally designed for cast iron, or to make iron castings



Using linoleum to build up a pattern.

from a pattern that was made for brass castings.

The linoleum is easily cut to size and shape; it can be bent to conform to curves and fillets; it does not split, and as many thicknesses as may be necessary can be used. The illustration shows how linoleum was used to build up a 120-in. forming press gear pattern at the Nutall plant of the Westinghouse Electric and Manufacturing Company.

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Over the Editor's Desk

ALONG with other methods that are being discarded by industry is the method of making an executive by selecting the most likely person among those who are familiar with the job and hoping that he will have the necessary ability to run his department efficiently. In his article "New Plan of Apprenticeship at Forbes & Myers," published in this issue, A. W. Forbes announces the conclusion reached by his company that future executives shall be selected after thorough tests and shall be trained for the leadership which they will be expected to assume.

Too many foremen have been picked for their jobs in the past because they themselves were fair mechanics and could assume a "hard-boiled" attitude which passed for executive ability. Too many sales managers have been selected because of a good sales record and the possession of a certain amount of egotism which passed, mistakenly, for character. These types are passing, and their places will be taken by men who will not only know the details of the work that is to be done under their direction, but who will also understand the relation of the functions of their departments to those of the plant as a whole, and the place of their particular firm in the industry to which it belongs.

One of the most important functions of the executive of tomorrow will be the ability to train those who are working under his direction, and not the least of his tasks will be that of instilling into his workers an appreciation of their individual jobs and an interest in their work.

Obviously only a person who has been especially trained will be qualified for this responsibility.

ONE of the most destructive forces with which we, as a nation, have to contend at this time is the chiseler. The chiseler will continue to hack away at the price on an article for which his firm is in the market as long as he knows there is any profit left upon which he can work. It is his creed to buy at the other fellow's cost and thus garner the entire profit for himself or his firm, leaving the supplier holding the bag. Everyone has to live, including manufacturers, and the natural result is that the manufacturer substitutes cheaper materials wherever he can in an effort to salvage something for his effort.

Unfortunately there are many who—under pressure from the chiseler—take the attitude that it is every man for himself and adopt the ancient slogan "Let the Buyer Beware." The net result thus far has been a flood of shoddy, cheap materials of every kind and description. The confidence of the public has been prostituted and many who could and would buy today are withholding their purchasing until they have some assurance that honest goods are available. It is unfortunate that the chiseler cannot see that, by his chiseling methods, he is making it impossible for those from whom he buys to enlarge their operations of buying, selling, and employment, and is thus retarding the recovery and progress of his own firm.

The sooner the chiseler reforms his methods of thinking and adopts a "live-and-let-live" policy, just that much sooner will industry and commerce be back on a sound and progressive basis.

New Shop Equipment

Jones & Lamson Milling and Centering Machine

The Jones & Lamson Machine Company, Springfield, Vt., has brought out an automatic double-end milling and centering machine with which both ends of shafts, stem gears, or other similar pieces can be milled to length and centered in one operation, in preparation for the turning operations.

The operation of the machine is as follows: The work is automatically clamped in V-blocks through the operation of electric torque motors, one of which is indicated at **D** in Fig. 1. The machine is started by shifting the lever **A**. The work-holding units move in rapid traverse to the milling cutters and both ends of the shaft are milled simultaneously to the required length. As soon as the milling cuts are completed, the machine moves the work by rapid traverse to the centering position and both ends of the shaft are centered to uniform depth. The centers are then withdrawn by rapid traverse and the machine stops.

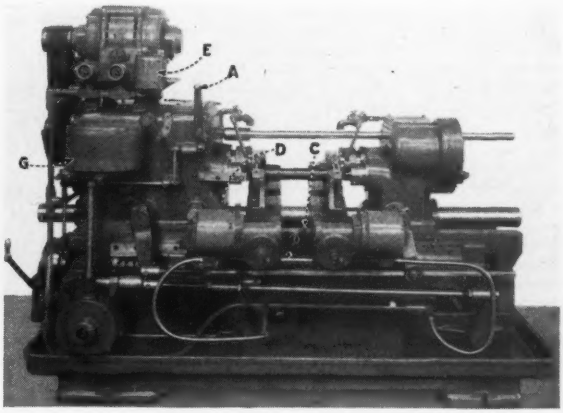


Fig. 1—Jones & Lamson Automatic Double-End Milling and Centering Machine.

The machine has a single pulley drive through a multiple disc clutch mounted in the main drive pulley. It is equipped with a variable speed headstock arranged for three speed changes through sliding gears. All gears and shafts are hardened and ground, and are mounted in ball bearings. The milling and centering spindles are mounted in ball bearings set up under a pre-determined load.

All movements of the machine are controlled through the use of hardened cams on the outside of the cam drums, and the work-holding units are supported on hardened and ground former blocks **C**, Fig. 1. The work is clamped in hardened V-blocks by means of the electric torque motors **D**, controlled through the conveniently-located drum switch **E**. Nine different feeds, ranging from 3 in. to 22 in. per min., can be obtained with pick-off gears located in the feed gear housing **G**. The rapid traverse movement is obtained through a multiple disc clutch and drive shaft **H**, Fig. 2.

The right hand milling head is adjustable on the ways of the machine through the use of a lead screw that is located at the rear as shown at **B**, Fig. 2. Both work supports are adjustable so that they can be located to grip forgings or shafts in a convenient position. By loosening two clamp screws, the work supports can be moved longitudinally on the center bar of the machine to suit various lengths of work. If desired, the machine can be supplied with hand-operated clamping units, as shown in Fig. 3.

The machine is built in various bed lengths with maximum distance between milling cutters of 20 in., 32 in., 44 in., 62 in., and 80 in. For short work, the right hand work holding fixture is removed and the right hand head is moved up so that the length of the work that can be milled and centered depends only upon the width of the remaining V-block and holder. The standard V-blocks, cutters, and cams are designed for round stock from ¾ in. to 3½ in. in diameter. Additional V blocks, cams, and cutters can be furnished to increase the capacity of the machine so that it will accommodate work up to and including 4½ inches.

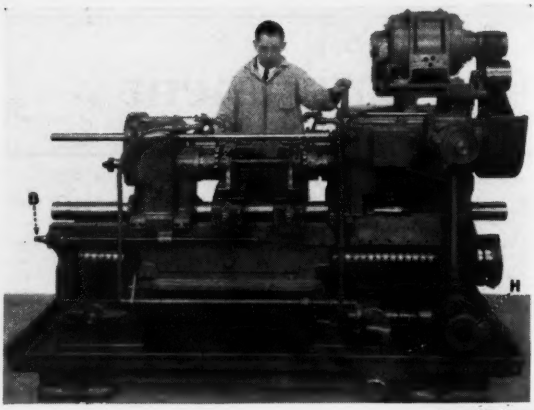
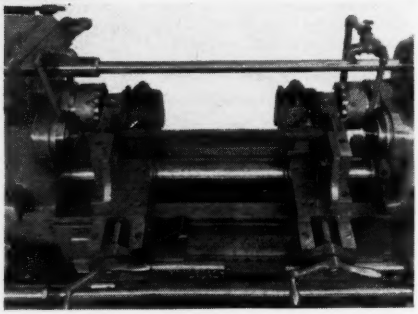


Fig. 2 (Left)—Rear View of Machine, Showing Milling Head Adjustment and Rapid Traverse Mechanism.

Fig. 3 (Below)—Hand clamping units can be used, if desired.



Standard equipment includes a coolant pump, piping, splash guards, the necessary wrenches, and hand-operated clamping units. By grouping the machines properly, one operator can easily operate three machines.

Kipp Caster No. 15

A new series of die casting machines in the low priced class has been announced by Madison-Kipp Corporation, 219 Waubesa St., Madison, Wis. The machines have been designed to meet the special requirements for the economical production of comparatively small parts—a field which is both new and extensive because it covers the casting problems of both the job shop and the small manufacturer, in addition to the large manufacturer who has diversified lines in which there are both small and large quantity runs.

The series comprises three machines; Kipp-Caster No. 11 for the production of parts in aluminum, duralumin, nicralumin, magnesium and similar alloys; Kipp-Caster No. 15, for the production of zinc, lead, and tin alloy parts, and Kipp-Caster No. 26, which is a combination of the No. 11 and No. 15 machines. Kipp-Caster No. 11 is an undershop machine; i. e., the metal enters the dies from the bottom at the parting line, with a metal well for hand loading and hand-operated plunger mechanism for introducing metal into the die cavity under pressure. Kipp-Caster No. 15 is a side shot machine; i. e., the metal enters at the side of split-gate dies. This machine is equipped with an electrically-heated melting pot and a plunger-loaded metal pressure goose-neck. The machine is semi-automatic in operation.

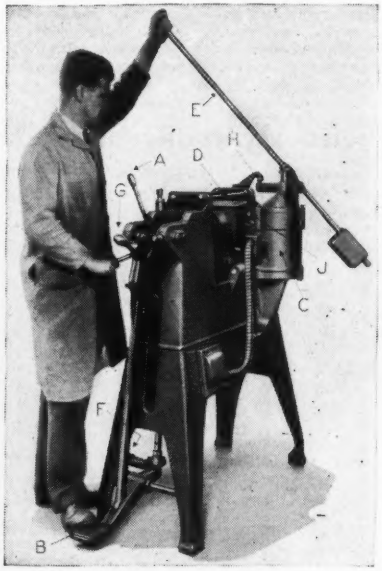
As the die halves are locked shut, the metal pot and goose-neck are automatically brought to casting position. The geared plunger lever is unlatched at this point so that it may be pulled down to force metal into the die cavity only at the proper time in the machine cycle. Core pulls are either automatic or hand-operated and casting ejection is automatic. Both hand and foot levers are utilized to make a complete cycle. Speeds of from three to eight shots a minute, depending upon the type of casting to be made, have been regularly maintained in substantial production runs.

The standard die size for the Kipp-Caster machine series is 6x6x3 in., but this size may be varied. Special ram heads can be provided for odd-shaped dies.

Special emphasis is laid on the features of the No. 15 machine, which is built for the casting of zinc and lead alloys. No previous experience is necessary to operate this machine. Acquiring speed is a matter of experience. The metal pot of the No. 15 machine holds 65 pounds of zinc alloy, and a standard plunger will cast up to 1½ pounds. The standard electrical heating element is furnished for 20-volt, 3 phase current—6,000 watts when turned on to the highest heat point.

Kipp-Caster No. 15 is furnished as shown in

the illustration except for the plunger handle G and the plunger assembly and metal well that go with it. The spoked wheel **A** closes the dies and rocks the electrically-heated



Kipp-Caster No. 15

metal pot **C** into casting position. The foot pedal **B** locks the dies. The arrow at **D** indicates the dies, over which there is a parting line guard. **E** is the plunger handle, and **F** is the foot lever for unlocking and opening the die, which automatically rocks the metal pot **C** out of casting position. Lever **G** is the plunger handle for forcing metal into the die cavity. Trip **H** is a safety device, preventing the plunger handle **E** from being operated until the dies are locked into casting position. Arrow **J** indicates the g o o s e - n e c k nozzle through which metal is forced into the gate at the side of the dies.

Selective Speed Gear Box for Landis Threading Machine

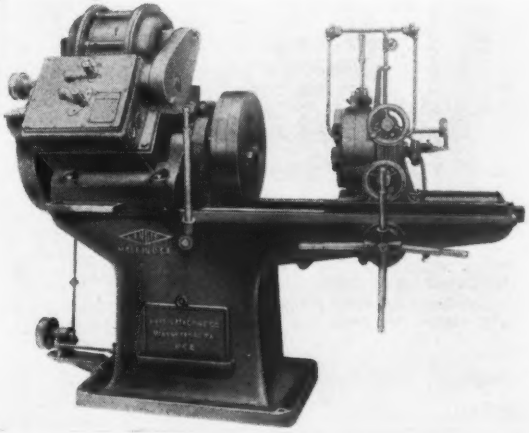
The Landis Machine Company, Inc., Waynesboro, Penna., has developed a new selective speed gear box for use on its motor driven 2-in. pipe threading and cutting machine, 2-in. pipe and nipple threading machine and the 2-in. and 2½-in. bolt threading machines. The new gear box as applied to the Landis 2-in. pipe threading and cutting machine is shown in the accompanying illustration.

This gear box has eight speeds. Due to the wide speed range thus obtained, the operating efficiency of the Landis machine is considerably increased by making possible the selection of a threading speed more exactly suited to the diameter of the work and the machineability of the material to be threaded. In this way, not only is production increased, but also chaser life is prolonged between grinds.

The speed changes are effected through self-locking levers which are conveniently located and easily operated. The lever positions for the various speeds are indicated by a speed plate attached to the gear box cover.

The unit is self-contained and is completely enclosed. There are no unguarded moving parts nor are there any openings to the interior of the gear box. All gears are cut from chrome nickel steel and are hardened and burnished. The gear shafting which is made of heat-treated alloy steel, is mounted on anti-friction bearings. Both gears and bearings are lubricated automatically by a splash system from an oil reservoir formed in the lower portion of the gear case.

Since this unit is self-contained, it is readily



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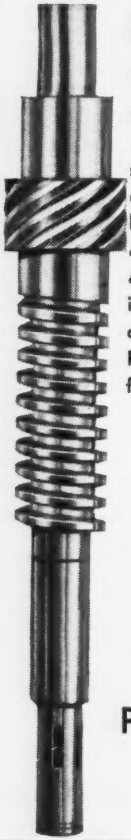

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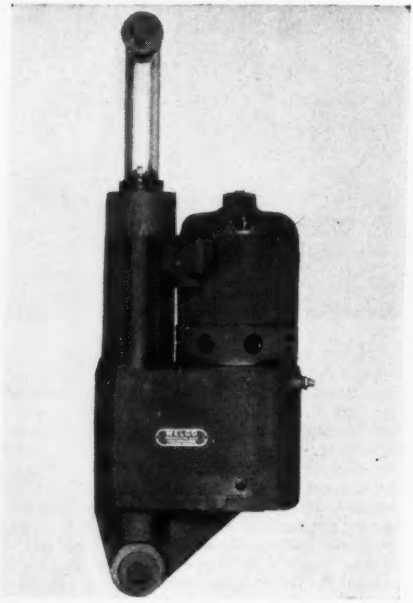
applicable to Landis machines of the sizes and types enumerated above and now in service. The selective speed gear box can be bolted to the head stock in the same position as the tumbler gear box or the speed reducing plate used as standard equipment on the constant speed and variable speed motor driven machines respectively. The new gear box is recommended in conjunction with either a. c. or d. c. constant speed motors wound for an approximate speed of 1200 r.p.m.

Welco Hydraulic Generator

The smooth operation, perfect control, and unlimited variation possible through the use of hydraulic power has brought about an increasing demand for a hydraulic pump which will operate with a high degree of efficiency,



Welco Hydraulic Generator

without undue heating, and which is of the simplest possible design. To meet this demand the B. A. Wesche Electric Company, 1630 Vine St., Cincinnati, Ohio, has developed the hydraulic unit shown in the illustration.

The unit is to be known as the Welco-Hydraulic Generator. It is self-contained, consisting of a constant speed motor and a high pressure radial pump, the design of which includes a number of unique features. The outstanding feature of the unit is that neither

oil storage tank nor relief valves are required. The generator can be operated in any position, and being self-contained, can readily be adapted to existing tools or other mechanical units such as furnace doors or tilting tables in steel mills. The length of travel is limited only by the length of the cylinder.

The unit illustrated is powered by a ¼ h.p. constant speed motor, direct-connected as shown. This unit is of the variable delivery type with control which can be operated either manually by means of a hand lever, or by power through the application of screw pressure, cam, or plunger movement, according to the requirements of the machine to which the unit is applied.

There are only seven moving parts in the unit. The rotor carrying the five generator pistons is mounted as a pendulum, reactance to the generated oil pressure being taken on a spring mounted in a cartridge, one end of which is in contact with a piston under oil pressure. Thus the rotor is held in equilibrium until displaced by means of the hand lever, plunger or cam. The normal working pressure of the pump is 1,500 pounds per square inch, but by substituting springs of various compressions, the pump can be made to operate at any pressure up to 5,000 pounds per square inch.

The work capacity in foot-pounds is governed by the motor power applied, pressure on the piston being inverse ratio to the piston speed. The speed of the piston is positively controlled within predetermined limits by the pump displacement setting and can be made constant or variable, independent of the load applied when the load is within the capacity of the setting. Reversal of the piston can be controlled electrically or mechanically, no valves being required to operate the piston in either direction. To reverse the piston, the direction of movement of the column of oil is reversed, which is accomplished by changing the position of the pendulum carrying the piston assembly either by hand lever or by power.

The generator is made with two distinct types of overload safety features—mechanical and hydraulic—either of which can be selected according to the needs of the application. The hydraulic overload feature automatically regulates the generator displacement until the mechanism is operating at the predetermined load in foot-pounds. In this case the speed of the piston is reduced proportionately when overloaded. The mechanical overload feature operates by varying the displacement of the pump, the cycle of operation being continued when the overload is removed. When the mechanical overload mechanism is used, the predetermined working pressure is never exceeded. Temperature rise is practically negligible during continuous operation at full load.

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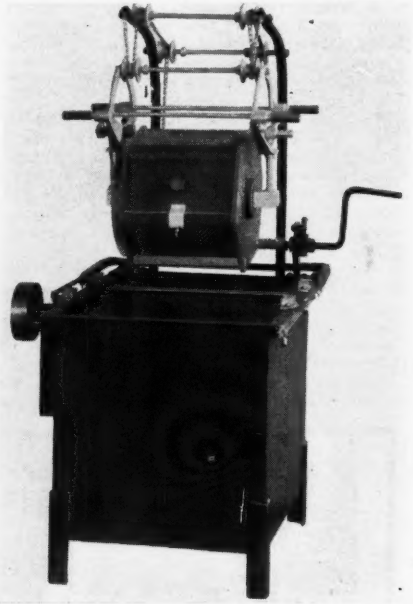
Maximum Junior Plating Machine

For the frequent small rush job of plating, or for production plating on small parts, the Udylite Process Company, 3939 Bellevue Ave., Detroit, Michigan, has brought out the small plating machine shown in the illustration. This plating machine, which is to be known as the "Maximus Junior," is a compact unit,



Udylite "Maximus Junior" Plating Machine ideally suited in size and design for the small plant that has a multiplicity of small plating jobs or for the larger plant in which the size of the jobs varies.

The machine is a complete plating unit in itself. It is designed to eliminate suspension of auxiliary barrels on the still tank cathode rod, which procedure disturbs production. Wall plugs are not required. The tank is of heavy welded steel construction, and the removable cylinder in which the small parts to be plated are placed is of perforated Formica. The cylinder can be raised from the solution and the load can be conveniently emptied by the use of a hand hoist and drain board, which are provided as standard equipment. The drain board prevents waste of solution.

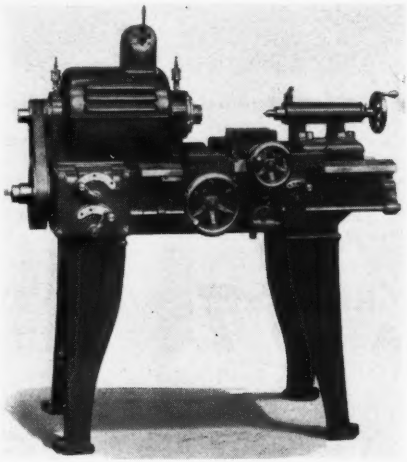
The unit is furnished for either belt or direct electric motor drive, the latter giving

the advantage of ability to place the machine in any position or location desired. It is supplied completely assembled with anode rods and connections. The tank is 28 in. long, 21 in. wide, and 22 in. deep. The cylinder is 12 in. diameter, and 12 in. long. Weight is approximately 80 pounds.

Le Blond 11-in. H. S. Lathe

An 11-in. precision lathe, designed to make possible the fullest advantages of tungsten and tantalum carbide tools, has been brought out by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The lathe is especially intended for production work where close dimensions and high speeds must be maintained. The frame is of rugged, heavy construction, and all bearings, gears, and other parts are designed and built to withstand the pressures and wear of heavy cuts, the strains of frequent starting and stopping, and the shock of excessive tool impact.

The heavy pressures and strains which are unavoidable in production work when carbide tools are used necessitated the development of a new type of motor head in which the multi-speed motor armature is mounted on the spindle. The spindle rotates in precision ball bearings. The spindle mounting is such that the end thrust is taken on the front bearing and the rear bearing is mounted so that it can float lengthwise in the head casting. This



LeBlond 11-in. H. S. Motor-Head Production Lathe

construction prevents any strain being set up due to expansion. The rigid design of the head makes it possible to bring the spindle up to a speed of 3,600 r.p.m. and stop it five

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times per minute. The spindle can be brought to top speed in two seconds and stopped in one and one-half seconds.

The bed is of unusually heavy design. The rear carriage bearing is flat, and the front way is an improved "compensating Vee" construction which resists tool pressure in all directions. Both the bed and carriage are nickel steel castings of very fine grain wear-resisting structure.

The apron is of one-piece box section construction in which all of the bearing brackets are cast integral. All shafts and studs are supported at both ends, thus insuring correct alignment of the gears. Drop forged steel is used for all gears excepting the rack pinion, which is of chrome nickel steel, heat treated and hardened. Both cross and longitudinal feeds are controlled by a single positive feed clutch. An automatic stop can be provided which will stop the carriage within two or three thousandths of an inch, thus making it possible to turn to a shoulder without using a hand feed.

The feed box provides for nine feed changes, all of which may readily be obtained through the use of two levers. The feeds are arranged in an approximate geometric progression, with a range which is adequate for any requirements.

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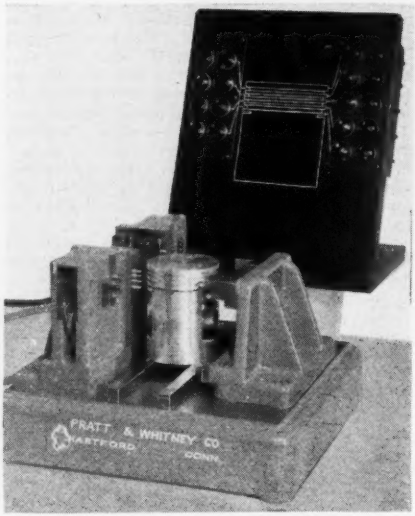
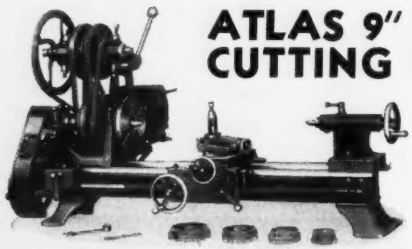
P & W. Electriclimit Gage for Checking Several Diameters Simultaneously

The Gage division of the Pratt & Whitney Company, Hartford, Connecticut, has developed an electric gage for checking a number of diameters simultaneously. The gage as



P & W Multiple-Diameter Electrolimit Gage

shown in the illustration is arranged to check nine diameters on an automotive piston, five of which are outside diameters and four are groove diameters. Checking is done by means of electric contacts arranged to engage the desired surfaces as the piston slides thru. If



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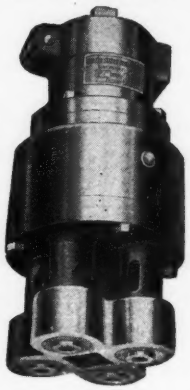

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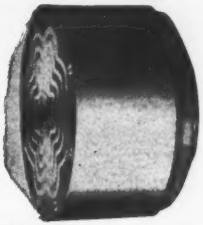

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all dimensions are within the desired limits, no lights appear on the indicating board. If any dimension is oversize, the corresponding green light flashes on, or if it is undersize, the red light appears as the piston is moved thru the contacts.

After several weeks of continuous performance on the inspection bench it has been found that this gage has cut inspection time approximately 65 per cent. 864 pistons per hour now are gaged as against 288 per hour previously—a ratio of 3 to 1. Moreover, there is a definite increase in uniformity and quality of inspection. A less skilled inspector is used on the job than formerly. This is because the new gage eliminates the human element factor entirely. The lights on the panel board either light or do not light, and the work is graded accordingly.

The application of this type of electric gage is very widespread. It can be applied to any piece where one or a multiple number of dimensions are to be gaged, thus lumping several gaging operations in the one with consequent savings. The general appearance of the gage will change for different jobs, but the fundamental principles remain the same. It is possible with this type of gage to hold limits closer than usual, and yet obtain entirely satisfactory gaging at high speed.

Duroskop for Testing Hardness of Wire

The R. Y. Ferner Company, Investment Bldg., Washington, D. C., is offering a special form of the "Duroskop" for testing the hardness of wire and other cylindrical materials of small size.

The Duroskop in its original form was intended for use in testing the hardness of metals in general, the hardness being determined from the angle of rebound of a falling pendulum. In the model shown here, the usual spherical anvil on the hammer-head of the pendulum is replaced by a cylindrical anvil, the axis of which is parallel to the pendulum rod.

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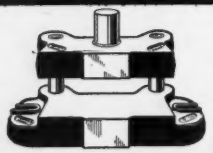

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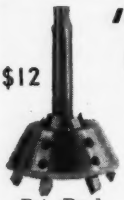

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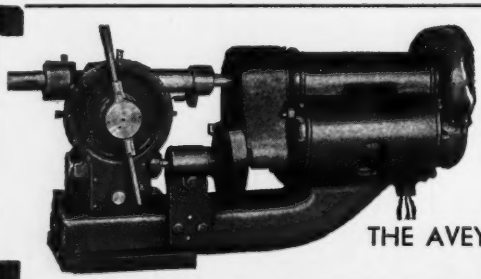

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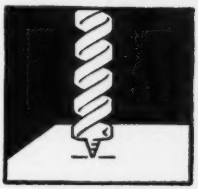

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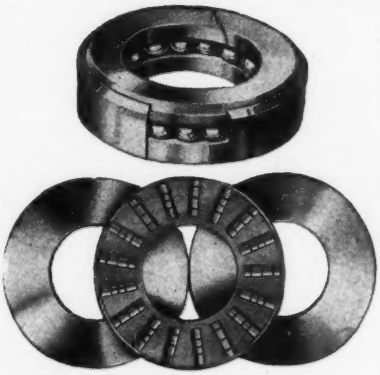

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The side of the cylinder strikes across the wire under test when the latter is held in a horizontal position.

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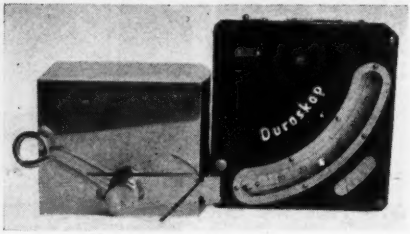


Duroskop for Testing Hardness of Wire

placed on the same level bench with the block, the wire will be at the same level as the point at which the hammer head of the pendulum strikes through the edge of the Duroskop case.

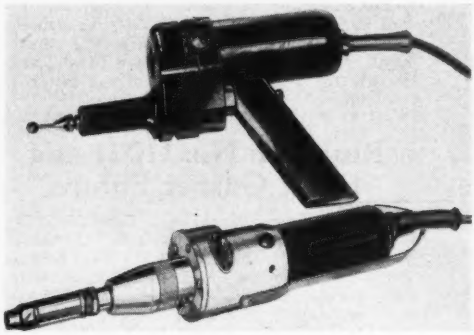
The Duroskop itself is entirely self-contained in a case 4⅛ in. square and 1¼ in. thick, finished in crystalline lacquer, the whole instrument weighing only 13 ounces. Setting of the instrument for each test requires but a second or two, and the test and reading can be made as quickly. The instrument can be used for testing wires as small as 0.004 in. or for cylindrical objects as large as 2 in. diameter.

United American Bosch Electrical Tools

A full line of precision electrical tools, designed to reduce productive operation costs by saving on time and power consumption and the elimination of spoilage, is to be brought out by the United American Bosch Corporation, Springfield, Mass., according to an announcement by that firm.

The first two tools of the line—an automatic electric screw driver and nut-setter, and a compact high speed electric die grinder—have been placed on the market. The design of the Bosch automatic electric screw driver incorporates several unique features, including extremely compact size. The tool is only two inches in diameter and it weighs 3¾ pounds. It is equipped with an automatic pressure clutch, additionally adjusted through a graduated scale, and a highly-efficient low current-consuming fan-cooled universal motor. The weight is centered to a nicety, so that the tool can be handled on fast work with speed

and accuracy. Resistex insulation is used throughout. One of the more important features of the tool is the stationary centering sleeve with self-centering bit, which provides



(Above)—Bosch High Speed Grinder. (Below)—Bosch Electric Screw Driver

an accurate and dependable adjustment for all types of screws and nuts and thus prevents damage to heads.

The Bosch high speed electric die grinder is a compact precision tool, especially applicable for finishing metal patterns and dies. It is designed to operate at a spindle speed of 50,000 r. p. m. without vibration, thus making it an ideal tool for use on fine, close work. This high speed also permits the use of extremely small wheels of 5/64 in. and up to 5/8 in. diameter. The efficient use of these small wheels makes it possible to grind in otherwise inaccessible places as well as to grind extremely small radii with accuracy. The pistol grip Resistex housing provides a practical and convenient method of handling the tool.

Stanley Speed Variator

To the end that there might be available a variable-speed constant horsepower device in which sensitiveness should be combined with rugged strength, and high efficiency with low maintenance cost, the Merritt Engineering & Sales Co. Inc., Lockport, N. Y., has developed the unit shown in the illustration. The unit is known as the Stanley Speed Variator, and consists of a built-in motor driving a variable speed power unit of the disc and roller traction type having a speed range of 3 to 1 with

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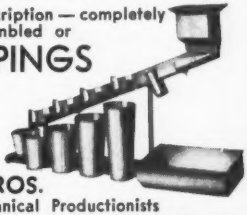

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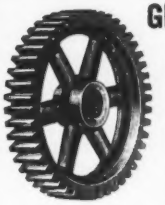

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an infinite number of speeds between these limits.

The Stanley Speed Variator is offered in units of 2 h. p. up to 20 h. p. capacity, and

Stanley Speed Variator

special units capable of a maximum speed range of 9 to 1 are also available. The outstanding characteristic of the unit is its constant horse power output at all speeds, which makes it available for practically all variable speed applications and eliminates necessity for over-motorizing in order to handle the load at bottom speeds.

The unit is compact, combining motor, speed variator, and speed reducer all under one cover. The unit comprises, practically, a flat-seat ball thrust bearing in which the balls in the form of rollers have become the driving elements while the races, taking the form of flat circular discs, provide variable-diameter race-ways between which the driving rollers operate.

Three pairs of driving rollers arranged radially about the output power shaft are positively-driven from the built-in motor. A pair of discs secured to the output shaft receive their motion through adhesive contact with the driving rollers. Simultaneous radial adjustment of the roller pairs effects the variable speeds of rotation of the output shaft. By an exceedingly simple spring arrangement the driven discs are given a pre-determined amount of pre-load upon the driving rollers which are in turn designed to sustain their given loads.

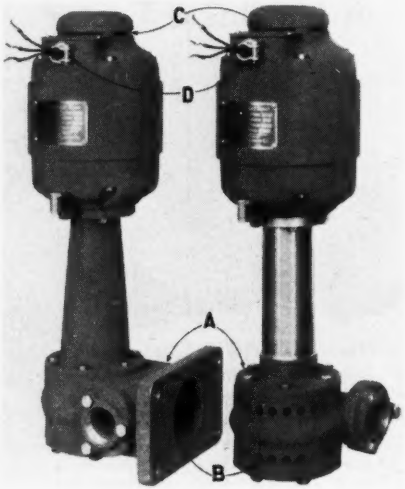
The balanced thrust loading of the discs entirely relieves the shaft bearings of thrust and leaves only normal shaft load reactions to the various ball bearings of the transmission. The three-point seating of the discs upon the roller pairs insures an accurate distribution of the pre-load over the driving rollers at all times.

The possibility of slippage between the rollers and discs is governed entirely by contact pressures provided by the fixed spring adjustment. The resistance to slippage in all cases exceeds the overload capacity of the motor.

Ruthman No. 11021 and 11022 Gusher Pumps

The Ruthman Machinery Company, 536 East Front St., Cincinnati, Ohio, has added to its line of gusher pumps the two vertical motor-driven pumps shown in the illustration. The mechanism of the two pumps is identical; the one at the left, however, which is the No. 11022, is intended for installation on the outside of the reservoir and the pump shown at the right. the No. 11021, is designed for installation in the reservoir, where it will be immersed in the fluid.

The housing (A) on either pump is reversible, which makes it possible to change the relation of the intake with the discharge so as to make it either right or left-handed.



(Left) — Ruthman Vertical Motor-Driven Gusher Pump No. 11022, for Installation Outside the Reservoir. (Right)—No. 11021 Pump, for Installation Inside the Reservoir.

The housing-stem which connects the pump with the motor, on the No. 11022 pump, is extra rigid, eliminating the necessity for an auxiliary motor-mounting bracket.

An outstanding feature of the new design is the twin suction intake (B), which consists primarily of two separate compartments communicating independently with the lower and upper sections of the impeller. The two compartments are of equal size, and maintain hydrostatically-balanced thrust with increased capacity.

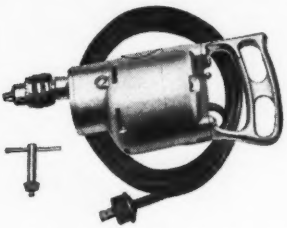
Self cleaning is accomplished automatically, when the flow is partially or totally throttled, by an internal agitation which exerts pressure outward through the intakes. This feature, together with the fact that no bearings are below or in contact with the coolant and that sufficient clearance is provided for grit to pass through harmlessly, enables the bearings to give good service in cases where the coolant is loaded with abrasive matter.

Although providing the advantages of a totally-enclosed motor, the motor is air-cooled, the cooling being accomplished by the use of a bowl-shaped disc fan within the motor and above the windings which forces the air upward and outward through the air-slot perforations (C) in the motor frame. This design also eliminates the possibility of damage from oil from the top ball bearing, as the fan throws out any oil, dirt, or chips that might find their way to the inside of the motor.

A built-in conduit outlet (D), cast integral with the upper motor flange, simplifies as well as increases the compactness and safety of the wiring.

Signal Portable Light Duty ¼-In. Electric Drill

A portable electric drill of ¼-in. capacity, especially designed for light duty, has been placed on the market by the Signal Electric



Signal Portable ¼-in. Electric Drill

Mfg. Co., Menominee, Michigan. Weighing only 6 pounds, the drill is powered by a de-

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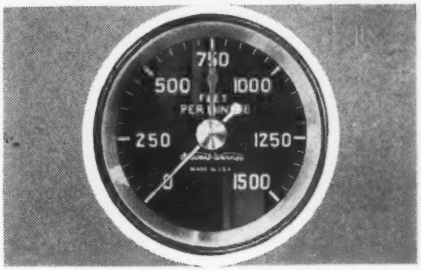

They make possible a control which prevents the high labor and machine costs due to uneconomical lowering of speeds by wage workers. They also enable the foreman to check at a glance, at distances of from 50 to 100 ft., too high speeds by piece workers—speeds that depreciate machinery, waste material and lower quality.

Stewart-Warner Tachometers have proved their accuracy and reliability over long periods of time. Booklet on application is yours for the asking.

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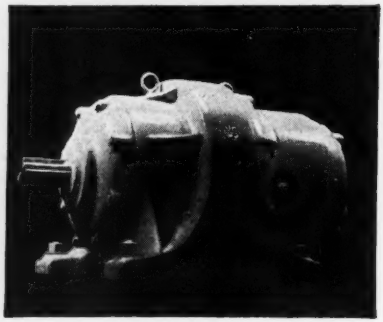
City ..... State.....

pendable Signal universal motor for D. C. or A. C., 110 volts, 25 to 60 cycles, with no-load speed to 1700 r. p. m.

The tool is 11¼-in. long from handle to chuck, and is 4 in. in diameter. The drill body and handle are of cast aluminum. Gears are of special heat treated alloy steel, and they operate in a grease-tight chamber. The tool is equipped with a trouble-free "make-and-break" switch, 8 ft. of heavy duty rubber covered cord, rubber plug, and chuck key.

U. S. Syncrogear Motor

U. S. Syncrogear Motors to deliver any speed from 2 r.p.m. to 10,000 r.p.m. are now being built by the U. S. Electrical Mfg. Co., 200 East Slauson Ave., Los Angeles, Cal.



U. S. Syncrogear Motor

The Syncrogear is a self-contained geared transmission and motor unit, foundationed on a heavy gear-pedestal base which supports the unusual torsional stresses inherent in high torque, geared reduction.

The driving unit is a U. S. Asbestos-protected AutoStart Motor. The rotor is of one piece, die-cast aluminum construction, and the windings are insulated with asbestos and electrically impregnated with Asbestosite. The Syncrogear transmission is mounted integrally in a gear case, supported by a pyramidal base as shown. The design of the Syncrogear is such that cantilever stresses from overhanging gears are minimized. A short gear-strain structure is used, which makes it possible to converge all torsonal stresses toward a center where the pyramidal gear-pedestal base supports the entire unit.

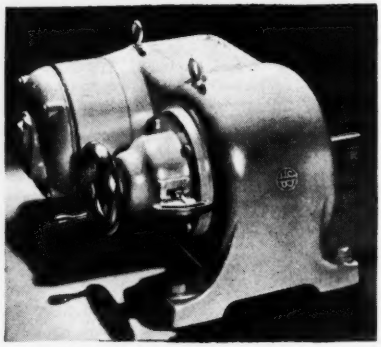
Power is transmitted through helical gears and pinions, providing a continuous rolling contact and smooth power flow. Gear and pinion blanks are forged from steels that are high in nickel, carbon, and molybdenum, and are heat-treated and ground. The gear compartment is fully enclosed, excluding foreign matter. Labyrinth seals prevent oil leakage. The case is so designed that either the gears or the rotor unit can be removed for inspection without disturbing other members. Anti-friction bearings are standard throughout the Syncrogear Motor, and supports for the main gear bearings are cast integrally, providing a non-yielding foundation for bearing alignment. Full rated horsepower is delivered to the take-off shaft.

The gears are partly, but never completely, submerged in oil. It is said that the dipping action maintains a lower oil temperature. Oil reservoirs are of generous capacity, being large enough for a six-months supply.

U. S. Varidrive Motor

Speeds from 25 r.p.m. to 10,000 r.p.m., controlled in steps as fine as 1 r.p.m. and adjustable while the driven machine is in motion, are available through the U. S. "Varidrive" electric motor, made by U. S. Electrical Mfg. Co., 200 East Slauson St., Los Angeles, Cal. The U. S. Varidrive Motor consists of a simple squirrel-cage motor and a variable speed differential which comprises dual discs coupled with the U. S. Varibelt. The differential discs, called "Varidiscs," reciprocally expand and contract in order to impart faster or slower speeds to the driven shaft, and speeds may be changed while the machine is operating, thus providing the utmost in flexibility.

The speed of the take-off shaft may be altered in such fine steps as 1 r.p.m. or in increments of 3 r.p.m., 5 r.p.m., or any other series. A movement of three degrees on the handwheel produces a change of 1 r.p m. in the speed of the take-off shaft, in a typical size motor. A full turn of the handwheel



U. S. "Varidrive" Motor

alters the speed 120 r.p.m. The remote control type has similar speed regulation. The Microspeed Indicator mounted on the case

tells at a glance the speed at which the take-off shaft is running. The scale of the dial segment is removable so that special scales calibrated to rate of production may be substituted if desired.

The speed of the Varidrive Motor is stable under all loads. The motor is so constructed as to eliminate the use of wound armatures, commutators, brush mechanisms, and contactors. Windings are insulated with asbestos and electrically impregnated with Asbestosite. Ball bearings are used throughout.

Bunting Announces Machined and Centered Phosphor Bronze Bars

A new line of cored and solid bars of Phosphor Bronze bearing metal announced by The Bunting Brass & Bronze Company, of Toledo, Ohio, eliminates a large part of the expense and labor heretofore necessary in machining bushings, bearings and bronze parts from bar stock. The new bars are available in a large variety of stock sizes. The Bunting bar is machined and centered. Outside diameters are concentric with inside diameters. The bars are 13 in. long instead of the conventional 12 in. Among the advantages claimed for the new Bunting Bar are:

Hard surface scale is removed, thereby eliminating cutting tool difficulties.

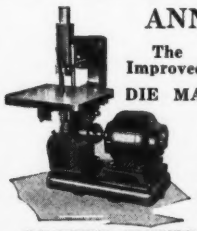
There are no under surface casting defects such as blow holes or sand inclusions, as any imperfect bars are scrapped by inspectors at the time the bars are machined at the Bunting factory.

The new bars are perfectly round and straight, which cannot be obtained in a rough casting.

Outside diameters are concentric with the bores, as the bars are turned on centers. This is important as cores often shift in the molding operations.

Bunting machined and centered bars are furnished with sufficient stock on the outside diameter to allow a finished bushing to be machined to the size labeled on the bar. Cored bars are rough cast on the inside diameter to the size stamped on the bar and the user should allow approximately ⅛ in. finishing stock on this dimension.

The centered ends permit a rapid set-up by machinists and a large saving in tooling time. Important also is the fact that the cored and solid bars are turned on centers, eliminating extreme variations in wall thickness and loss of material in machining, which material would be of little value as scrap.



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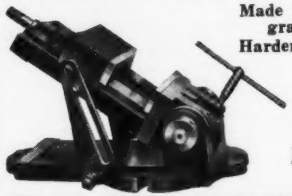

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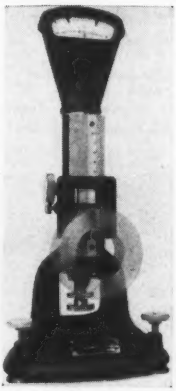

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1133 Investment Bldg., Washington, D. C.

The 13-in. bars will allow the machinist to obtain multiples of standard bushing lengths such as 1½, 2, 3, 4 and 6 in., which cannot be done in a 12-in. bar due to length loss in the cutting off operation.

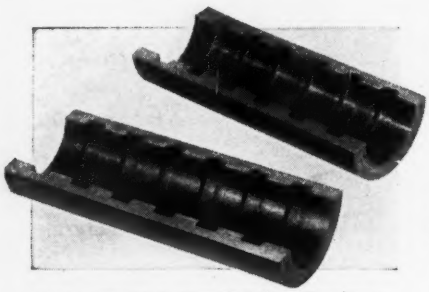
Gatke Moulded Non-Metallic Bearings

Gatke Bearings, for a number of years made exclusively for steel mill service, are now available in a complete line for all general machinery uses, according to an announcement of the Gatke Corporation, 230 N. LaSalle St., Chicago, Ill. The requirements of rolling mill service for accuracy and resistance to tremendous pressure, wear, water, acids, heat, and so on, have resulted in developments in construction that make Gatke bearings adaptable to all requirements.

Gatke non-metallic bearings are composed of a special textile base impregnated with synthetic resins, moulded under high pressures, and manufactured in all shapes and sizes. They are moulded of three basically different materials for various services, known as Gatke Hydrotex, Gatke Lubritex, and Gatke Grafitex.

Gatke Hydrotex bearings are recommended wherever bearings run in water or where water is available for lubrication. They are also designed for equipment that is oil lubricated.

The Gatke bearings can be used to replace any bearing or bushing. They can be moulded to dimensions with inserts, if required. No machining is necessary. Characteristics do not change with age, and no deterioration occurs if machinery is idle or bearings are neglected for long periods. They have a low co-efficient of friction and are not affected by ordinary acids, chemicals, solvents, or salt water, or softened by oils or greases.

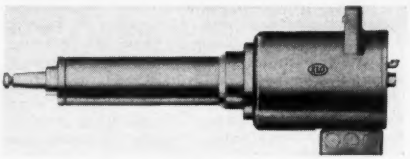


Gatke Moulded Non-Metallic Bearings

Hydrotex, Lubritex, and Grafitex bearings are now available for journal diameters from ⅛ to 24 in. and can be made to still larger sizes. These materials have an extremely high tensile and shearing strength and a tremendous pressure resistance, although the weight is but one-seventh that of bronze bearings. They are adaptable to all service conditions.

Ex-Cell-O Inbuilt Balanced Motor Driven Grinding Spindle

Ex-Cell-O Aircraft & Tool Corporation, 1220 Oakman Blvd., Detroit, Michigan, announces an inbuilt balanced motor-driven grinding spindle designed for use with the No. 3 Abrasive surface grinder, as shown in the illustration.



Ex-Cell-O Inbuilt Balanced Motor-Driven Grinding Spindle

The rotor of the electric driving motor is mounted directly on the spindle shaft, eliminating the necessity for couplings or similar methods of drive between the motor and spindle. The motor field is mounted in the opposite end of the spindle from the grinding wheel, forming a compact and rigid unit. The electric motor, which is 1 h. p., can be furnished for 220, 440, or 550 volts, three-phase, 50 or 60 cycle operation.

The grinding spindle portion of this unit is of standard Ex-Cell-O spindle construction. Ex-Cell-O precision ball bearings are used throughout except on the outer end of the motor, where an "Oil-less" bearing is used.

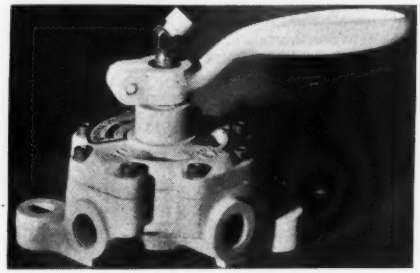
The development of this unit eliminates the necessity for belt and pulleys for driving the grinding spindle. Thus vibration is reduced to the minimum, heavier cuts can be taken at each pass of the wheel, and a uniformly high finish can be maintained.

Hanna "Unitite" Valve

A packless valve suitable for air, oil, or water at pressures up to 250 pounds per square inch, called the "Unitite" Valve, has been placed on the market by Hanna Engineering Works, 1769 Elston Ave., Chicago, Ill.

The valve is equipped with a simple but effective arrangement for lubrication of the moving parts, both the disc and the stem being positively lubricated by an oil well in the stem.

Balanced disc pressure throughout the contact area is attained by the arrangement of seat ports and disc pockets. Perfect contact between them is maintained. The two-piece disc and stem rotate as a single unit. The



Hanna "Unitite" Valve

disc is free to find its own seat and cannot be unseated by a lateral force on the stem.

The "Unitite" valve is universal in its application; it may be used as a straightway, 3-way or 4-way valve. Two inlet ports facilitate piping. All the advantages of full direct port opening with a 40-deg. movement of the operating handle are available; reversal is obtained with an 80-deg. movement. Between reversals, the discs rotate on two eccentric points while in contact with the seats. Circular lines of contact or scoring do not develop; both disc and seat wear uniformly across their full diameter, thus assuring tightness. The valve disc seats on the valve bonnet, and both may be reground without removing the body from the pipe line or disturbing pipe connections or valve mountings.

The operating handle may be adjusted to the most advantageous operating position. The bonnet is secured to the body with hardened chrome molybdenum socket head cap screws. An alloy lead gasket seals the joints between the bonnet and the body. The valve is available in ⅜, ½, ¾, 1, and 1¼ in. sizes.

Van Keuren Rectangular Gage Blocks

To meet the need for frequent and economical replacement of worn gage block standards, a complete 81-block series of standard rectangular-shape precision gage

FACTS

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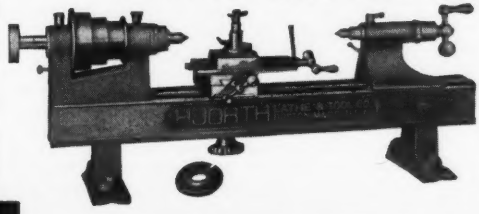

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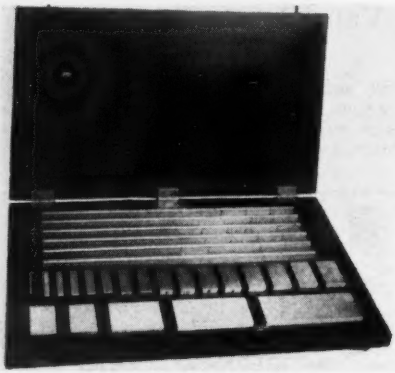
HJORTH LATHE & TOOL CO.
60 State St., Boston, Mass.

blocks from 0.050 in. to 4.000 in. is now being offered by The Van Keuren Co., 14 Copeland St., Watertown, Mass.

The gages are of first quality, long-wearing alloy tool steel, approximately ⅜x1¼ in. and ⅜x1⅜ in., of exceptional hardness, thoroughly seasoned and with mirror-like surfaces optically flat and parallel so that they can readily be combined by wringing together. The precision dimension is held to a tolerance of 8 millionths of an inch and the blocks are guaranteed as reliable standards at 68 deg. F., secured by light wave comparison with standards originating from the United States Bureau of Standards.



81-block set of Van Keuren Rectangular Gage Blocks.

The blocks are available as individual gages in a 33-block, ten-thousandth combination set for departmental or small shop requirements, or in the complete 81-block set shown in the illustration.

Murex "Straight Gap" Welding

A new development in arc welding, particularly suited to the joining of heavy plates, is announced by the Metal & Thermit Corporation, 122 Broadway, New York, N. Y.

Known as Murex "Straight Gap" Welding, the new process does away with all need for "veeing" or grooving of flat edges. Plates may be used just as they come from the mill. Greater welding speed, as well as appreciable reductions in cost, are claimed. In fact, the developers of the process say that it cuts welding time in half, and, by eliminating all preparatory work and reducing the quality in welding metal required, achieves economy in welding heavy plates. In addition, it is stated, tests conducted by outside laboratories show that "Straight Gap" welds are physically superior in many ways to those in which the usual "V" or "U" gaps are employed.

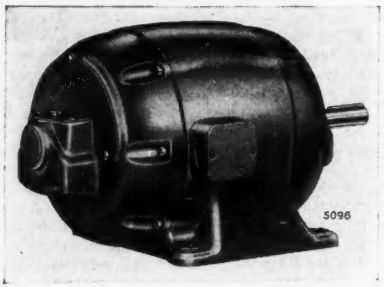
At the same time, the above company announces an addition to its line of Murex Heavy Mineral Coated Electrodes. The new unit, Murex "Universal," is for use on mild steel and may be employed in either flat, vertical, or overhead work. Smooth, clean deposits of unusually high tensile strength and ductibility are obtained consistently, it is said, on any of these classes of work.

Literature covering both of these items may be had from the Metal & Thermit Corporation at the above address.

Emerson Announces Line of 3 H P Motors

Manufacturers of motor driven appliances and equipment will be interested in the announcement of a new line of 3 h.p. motors by The Emerson Electric Mfg. Company, St. Louis, Mo. The new Emerson 3 h.p. motor operates at 1725 r.p.m., and is furnished in the single-phase, repulsion start induction type, the polyphase squirrel cage type, and direct current, compound-wound.

This motor is built with frame of rugged construction. The shafts are of tool steel; bearings are of bronze and are wool-packed. Oil reservoirs are oversize so that only infrequent relubrication is necessary. The motor is designed to operate continuously without overheating.



Emerson 3 H. P., 1725 R. P. M. Motor.

Motor frames have ventilating openings and the fan on the armature shaft provides a constant circulation of air through the motor. Ventilating openings are so arranged that protection is afforded from damage from dirt or water falling from above. The motors are built to Nema dimensions and the mounting dimensions of the single-phase, polyphase and direct current frame are identical, which simplifies the problem of motor mounting.

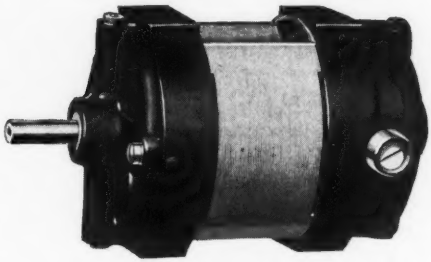
Dumore K-3, J-3, and EEXQ Motors

The Dumore Company, Racine, Wis., has added to its line of electric motors the three motors shown in the illustrations. The K-3 motor is a series-wound universal motor especially designed for applications where better than average performance is required. It is capable of carrying heavy loads without overheating. Ratings are: 30 minutes at 5500 r. p. m.—1/6 h. p., continuous duty at 6500 r. p. m.—1/8 h. p.

The J-3 motor is the same as the K-3 except

Dumore Type K-3 Electric Motor

that the design of the housing is slightly different and the method of ventilation is changed. This motor is especially adapted to the operation of electrical tools such as port-



Dumore Type J-3 Electric Motor

able drills, saws, sanders, vacuum cleaners, floor polishers, and so on.

The EEXQ motor is intended to meet the demand for a small inexpensive slow speed universal motor in perfect dynamic balance.

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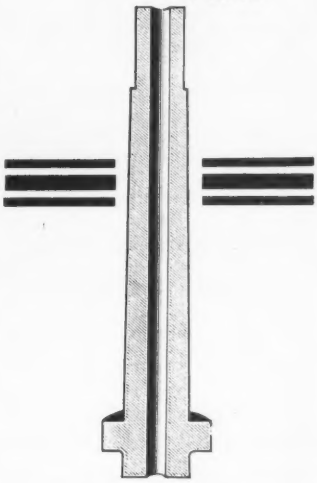

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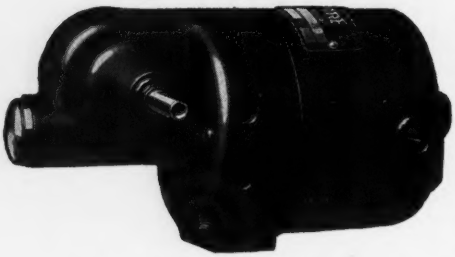
AMERICAN HOLLOW BORING CO.

2000 Raspberry St.
Erie, Pennsylvania

A single worm gear reduction forms an integral part of the unit. The full load motor speed is 8,000 r. p. m. Gear ratios of 15:1,



Dumore Type EEXQ Electric Motor

30:1, and 40:1 are available as standard. Thus shaft speeds of approximately 200 to 750 are possible.

"Economy" Face Milling Cutter

A face milling cutter in which toolbits are used for teeth and which is so designed that the bits can be sharpened by hand individually has been placed on the market by J. E. Freyman & Sons, 3633 Keswick Road, Baltimore, Md. The features claimed for this cutter are (1) low initial cost, (2) low maintenance cost, (3) rugged design and construction, and (4) that it is efficient and practical in use.

"Economy" Face Milling Cutter

The tool consists primarily of a cast steel head in which is anchored a No. 9 B & S taper shank. Set into the head at an angle are eight ⅜x⅜x3-in. tool bits of Rex AA steel, each held in place by two safety setscrews. The principal advantage of the cutter consists in that the toolbits can be removed singly and ground by hand on an ordinary grinding wheel, and then re-set in the cutter-head. When in use in a vertical milling machine, the toolbits are set evenly in the head by using a block of steel or a thickness gage between the machine table and the point of the toolbit. When in use in a horizontal milling machine, an angle plate is clamped to the machine table and a thickness gage is used to set the toolbits even.

The cutter will be supplied without arbor or cutters so that the user may make his own arbor or use any kind of toolbits he prefers, if desired.

Skyco No-Glare

Glass panes in factory windows can now be coated with a liquid that, while permitting the passage of 94 per cent of the sunlight, eliminates the glare and reduces the heat by 15 per cent. No-Glare is a sky-blue liquid that may be painted or sprayed on the window panes. It dries quickly, leaving an even, opaque film that filters out the infra-red rays of the sun. Thus while allowing the passage of nearly all of the original light, the glare that results from direct sunlight is eliminated, together with the strain on eyes and nerves. A gallon of the liquid will cover approximately 750 square feet of surface. Although weather-proof, it can be easily removed with a brush and water.

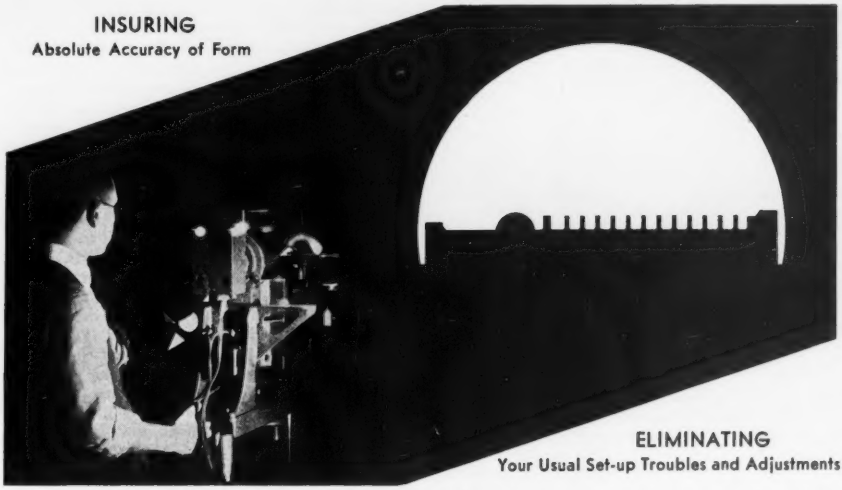
"No-Glare" is a product of The Skybrite Company, 1921 East 19th St., Cleveland, Ohio.

Willson Transparent Cup Goggle

Goggles made of transparent material which permits the free passage of light and provides a comparatively unobstructed view to the wearer has been placed on the market by Willson Products, Inc., Reading, Penna. By using this goggle the "blinder" feeling is eliminated, and the wearer obtains a visual comfort which is impossible with the opaque type of goggle cup.

It is stated that no sacrifice of the requirements of a good goggle was necessary in order to obtain cup transparency. The goggle is sturdy, has ample strength to withstand impact, is spark proof, and is extremely light in weight. Because of the lighter weight of the material, it was found possible to produce a roomier and better ventilated goggle of less weight. The result is a goggle which will serve well for general all-purpose use and which can also be worn over spectacles. Special models for over-spectacle wear and the replacement parts for such models will be unnecessary where the transparent cup goggle is used.

Willson Transparent Cup Goggle



Ground Form Tool for a Radio Condenser Shaft Being Projected Against an Enlarged Master Chart

Use Morrison Special High Speed Steel Ground Form Tools for greater accuracy, more pieces per grind, better finish on your products and lower tool cost. Submit blueprints for a quotation. You will find our prices are lower.

MORRISON MACHINE PRODUCTS, INC., ELMIRA, NEW YORK

It is expected that the lighter weight, full visibility, and greater comfort of the transparent cup goggle will promote the use of goggles in the shop and thus aid in the reduction of eye accidents.

"American-Swiss" Needle File with Kurled Handle

"American-Swiss" Needle File With Knurled Handle

The line of needle files manufactured by the American Swiss File & Tool Co., 410-416 Trumbull St., Elizabeth, N. J., has been augmented by the addition of a needle file with a knurled handle or tang, replacing similar files of the older style which were made with smooth round tangs. The knurled tang prevents slippage and assures a firm grip without cramping the fingers and hand of the user. The needle files with knurled handle are made in all the regular shapes and sizes.

Westinghouse Gearmotors

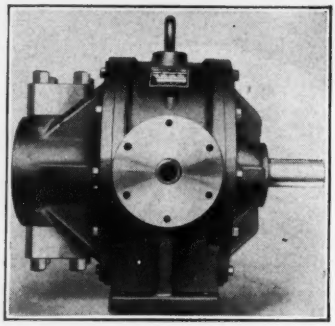
An eight-page illustrated publication describing the complete line of Westinghouse gearmotors has recently been announced by the Westinghouse Electric and Mfg. Company, East Pittsburgh, Pa. These single and double reduction gearmotors consist of a simple all external type speed reducer combined with a standard motor. The illustrations include pictures of several applications, together with detailed views of each model. Tables of output speeds for each model are included.

Also, a revised publication has been issued titled "Westinghouse Multispeed Gearmotors", with which has been included tables for horsepower rating and speed tables for motors from ½ to 15 horsepower ratings. These multispeed gearmotors have four instant speed changes.

Copies of these publications may be obtained from the nearest district office or direct from the advertising department at the above address.

H-P-M Hydro-Power Units

In line with the modern trend toward the application of hydraulic power to presses and other pressure-operated equipment, The Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, is offering a line of hydro-power



H-P-M Type RA Hydro-Power Unit

units one of which is shown in the illustration. The H-P-M Hydro-Power Unit has been developed particularly for heavy duty hydraulic machine drives and is the product of an organization with years of intensive experience in the development of this type of drive and its application.

The pump illustrated is the Type "RA" H-P-M Variable Stroke Radial Pump, intended for heavy duty work. The low power consumption, high volumetric efficiency, and smooth, vibrationless operation are said to be proven not only by numerous tests but also by extensive service in a variety of applications.

The pump is said to deliver a smooth, even pressure flow and to maintain it automatically and steadily. Any working pressure desired can be obtained and the pressure is quickly adjustable in a stepless range up to maximum. The use of this unit eliminates all necessity of planning hydraulic power requirements for years ahead, as was necessary with the older types of systems.

Rivett Bulletin 608-B. Bulletin 608 B, issued by the Rivett Lathe & Grinder Corporation, Brighton Dist., Boston, Mass., illustrates and describes the Rivett 608-B Precision Back-Geared Screw Cutting Lathe. The machine is shown as set up to perform a variety of the tasks for which it is intended, and all the various tools and attachments are illustrated and described, with explanations of the tasks for which they are intended and the manner in which they are used. Copies free.

Rivett Bulletin 120-A. This bulletin contain sixteen 8½x11-in. pages devoted to descriptions and illustrations of the bench lathe mountings and driving equipment made by the Rivett Lathe & Grinder Corporation, Brighton Dist., Boston, Mass. The bulletin contains 33 illustrations, both photographs and drawings, show-

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ing the different methods of mounting the Rivett bench lathe and the various pieces of equipment used in mounting and operating the machine. Copies free.

Atlas Bench Lathe Catalog

The Atlas Press Company, Kalamazoo, Michigan, has issued a catalog describing and illustrating the Atlas 9-In. Bench Lathe and the uses to which it can be put. The text matter dwells upon he advantages of the V-belt drive, Zamak alloy parts, economy of power, range of speeds, and other features of the machine.

Included also are descriptions of the Atlas Universal Lathe Grinder and the Atlas Milling Attachment, designed for use on the Atlas Lathe. A number of illustrations show the many and various uses to which these attachments may be put, such as grinding small bushings and other cylindrical work, sharpening reamers, grinding pistons and valves, milling T-slots, milling dovetails on tool work, and so on.

A copy of the catalog may be had by addressing this firm as above.

"Steel Mixture" Fire Brick, High Temperature Fire Cements, and Plastic Refractories

McLeod & Henry Co., Troy, N. Y., has issued a booklet in which are described and illustrated the refractories made by this firm. Included, also, are paragraphs of information concerning the selection of fire brick, the uses of the various kinds of brick and clay, pointers on the construction of furnaces, and general information regarding the handling and uses of materials made by this company. Copies free upon request.

Mummert-Dixon Facing Heads

8 Sizes—6" to 40"

We can't say much here . . . but if you write for a bulletin we'll show you how this tool will save you money.

MUMMERT-DIXON CO.
120 Philadelphia Street
Hanover, Pa.

Brown Compensated Air Cell

The Brown Instrument Company, Philadelphia, Penna., has developed a new type of battery which, when used with the Brown Potentiometer, eliminates the necessity for frequent standardizing. The new battery, which is called the Brown Compensasted Air Cell, has a constant current output and a life of over 2½ years, thus assuring potentionmeter users of continuous accuracy with a minimum of attention. It can be used with all types of Brown Potentiometers. Bulletins available.

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Lubrication by Barrel-To-Bearing System: The most modern system of lubrication for machine tools is described in a folder that can be had by writing to Alemite Corporation, 2680 N. Crawford Ave., Chicago, Ill.

Chucks—Key and Keyless: Bulletin No. 120A, 632, and 633, issued by T. R. Almond Mfg Co., Ashburnham, Mass., describe and illustrate the line of key and keyless geared nut and ball bearing drill chucks made by this firm. Copies free upon request.

Cut Your Sawing Costs: "Lenox" hack saw blades and band saws are guaranteed to effect savings on your sawing operations. Write for information to American Saw & Mfg. Co., Springfield, Mass.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

"Atlas" Bench Lathe: A 9-in. screw cutting, self-contained, motor-driven bench lathe is now being built by Atlas Press Co., Kalamazoo, Mich. Write for circular.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Drop Forged Steel Die Sets: The economy and other advantages of drop forged steel die sets, which are now being made by E. A. Baumbach Manfg. Co., 1806 South Kilbourn Avenue, Chicago, Ill., are explained in a folder that can be had by addressing this firm.

Bushings and Bearings: 500 sizes of finished bronze bushings that are available immediately are shown in a catalog that can be had by writing to The Bunting Brass & Bronze Co., Toledo, O.

Gears of All Kinds are described and illustrated with specifications, in Catalog 80, which has been issued by the Chicago Gear Works, 769-773 West Jackson Blvd., Chicago, Ill.

Boring Tool With Micrometer Adjustment: A circular describing and illustrating the Palmgren Off-Set Boring Tool, which is adaptable for either tool or production work can be had by addressing the Chicago Tool and Engineering Co., 84th St. and So. Chicago Ave., Chicago, Ill.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Diamond Boring: The newest methods of diamond boring all kinds of bearings, gears, motor frames, small bushings, and other similar work are outlined is a bulletin that also describes and illustrates three new diamond boring machines. A copy can be had by addressing the City Machine & Tool Works, 1521 East Third Street, Dayton, Ohio.

Centerless Grinding: A high-speed service at low cost. If you have cylindrical parts to be ground, send blue-prints for estimates to Commercial Centerless Grinding Co., 6538 Carnegie Ave., Cleveland, Ohio.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Steel Spacing Washers: Milling jobs can be set up quicker by using standard spacing washers, made by Detroit Stamping Co., 1345 West Fort Street, Detroit, Michigan. Write for information.

"Speed" Spot Welders for welding metals from 0.0005 in. to ⅝ in. thick are described in a catalog that can be had by addressing Eisler Electric Corp., 761 South 13th Street, Newark, N. J.

Better Supervision: Write to Elliot Service Company, 242 West 55th St., New York, N. Y. for a free sample copy of "Management"; and information service for plant executives and department heads, based upon actual shop problems and factory experiences.

The Red Liner is an automatic machine that inspects gears under conditions similar to those of actual operation, and charts errors on a 200-to-1 scale. Write Fellows Gear Shaper Company, Springfield, Vt., for booklet.

Performance Data On Swiss Jig Borers: This 36-page pamphlet shows various types of jobs from a power shovel turntable jig to a television disc, drilled and bored on Societe Genevoise High Speed Precision Borers, giving data as to size of holes, accuracy and time savings. Free upon request to The R. Y. Ferner Co., 1008 K Street, N. W., Washington, D. C.

Tool Grinding Costs can be cut by using the "Economy" face milling cutter. Write to J. E. Freyman & Sons, 3627 Keswick Road, Baltimore, Md., for information.

Stampings of any kind or size can be obtained from Gerding Brothers 5 East Third Street, Cincinnati, Ohio. Write for particulars.

Dynamic and Static Balance: Full information as to what static and dynamic balance means, the necessity for correct balance in rotating parts, methods of discovering and correcting unbalance, and the uses of balancing equipment can be had without charge by addressing Globe Tool & Engineering Co., Dayton, Ohio.

Ball and Roller Bearings, either journal or thrust, for all purposes and all sizes, are described and illustrated in catalog No. 9 which has been issued by The Gwilliam Company, 360 Furman Street, Brooklyn, N. Y. Copy free upon request.

Drive Your Bench Lathe, Bench Miller, or other light machines with the "Cataract" Six-Speed Motor Drive Unit, made by Hardinge Brothers, Inc., Elmira, N. Y. Write for full information.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 60 State Street, Boston, Mass. Copy free upon request.

Pyrometers: Inexpensive portable and stationery, single unit and multi-circuit pyrometers are described in a catalog issued by Illinois Testing Laboratories, Inc., 146 West Austin Avenue, Chicago, Ill. Copy free upon request.

Oil and Waterproof Chucks: The J & H Electric Co., 202 Richmond Street, Providence, R. I. is now making a chuck that is oil and waterproof, and is designed to provide a maximum of holding surface with exceptionally strong and uniform pull throughout. Ask for complete information.

Solve Your Tapping Problems with a Jarvis Tapper. Tapping devices for every type of job. Write The Charles L. Jarvis Co., Gildersleeve, Conn., for information and prices.

Dress Your Grinding Wheels Better, in less time, with less waste of wheel and diamond by using Koebel Multi-Point Diamond Dresser. Write Koebel Diamond Tool Co., 1200 Oakman Blvd., Detroit, Michigan, for details.

Threading Machinery: Complete catalogs of individual bulletins covering the pipe threading and cutting machines, bolt threading machines, or die heads made by Landis Machine Co., Waynesboro, Penna., may be had upon request from this firm. State size and type of machine or die head.

Do you buy the same cutter over and over again? Every time you grind a cutter on an old-fashioned time-wasting cutter grinding machine, you are paying for new cutters that you never get. Let the Landis Tool Company, Waynesboro, Pa., tell you how to save this money. Write today.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

"Hand-ee" Grinder: A grinder for use on dies, tools, and other fine work, made to fit the hand, weighing one pound, with plug to operate from light socket, is described in a folder that can be had by addressing the M. C. Tool Co., 120 South Aberdeen St., Chicago, Ill.

Screw Machine Feed Fingers for all makes of automatic screw machines, designed to save 30 per cent to 80 per cent of screw machine time and made for long wear, are described in a bulletin that can be had by addressing Morrison Machine Products, Inc., Elmira, N. Y.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation., Stamford, Conn.

"Commercial Lapping for Close Limits and High Production" is the title of a booklet that discusses hand and machine lapping, types of lapping tools and machines workholders for machines, preparation of laps, preparation of work for lapping and other important points. A copy may be had by addressing Norton Company, Worcester, Mass.

Die Making Machines: How dies, templates, pages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Good Gears of all kinds—spur, spiral, bevel, worm, hypoid—in fact any kind or type of gear desired, large or small, machined to an excellent finish and the highest degree of accuracy, may be obtained from Perkins Machine & Gear Co., 151 Circuit Ave., Springfield, Mass. Write for estimates.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Steel Stamps and Marking Dies: Full information as to steel stamps, steel roller dies, embossing dies, and embossing rolls made by the Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be had by writing this firm.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

An Electric Hand Shear will save time, material, and labor on jobs that are too small, too large, too complicated, or too cumbersome to be handled in the power shear. Ask The Stanley Electric Tool Co., New Britain, Conn., for catalog.

A Visible Record of Performance of your machines will enable you to keep check on the production of each unit. Ask Stewart-Warner Corporation, 1826 Diversey Parkway, Chicago, Ill., for the booklet on "Tachometer Application To Industrial Machines."

Cutting and Grinding Facts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are are used, is contained in a booklet that is issued by the Sun Oil Company, 1608 Walnut Street, Philadelphia, Penna. Free upon request.

A Self-Starting Hack Saw Blade: The Milford Duplex blade is made with fine teeth on the front end, to start the cut on the first stroke. Write The Henry G. Thompson & Son Co., New Haven, Conn.

Protection and Beauty can be added to the selling points of your product by applying a metal coat of Udylite-Cadmium. Ask Udylite Process Co., 3939 Bellevue Ave., Detroit, Michigan, for complete information as to equipment required, methods, costs, etc.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, surface grinders, toolpost grinders, and bench and floor grinders is described in Catalog No. 33, published by The United States Electric Tool Co., 2471 West Sixth Street, Cincinnati, Ohio. Copy free.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati, Ohio.

Silent Steel Gears: The two important advantages of silence and durability are combined in the Waldron Laminated Silent Steel Gear, marketed by Smith & Serrell, 20 Washington Place, N. J. Write for sizes, cutting directions, prices.

"Extra Value" Hack Saw Blades: Hack saw blades made of an alloy in which molybdenum is used, and which are said to withstand shock and wear to an unusual degree are now being made by Victor Saw Works, Middletown, N. Y. Full particulars will be sent upon request.

Power Drive in Any Position: The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook." Copy free to any mechanical executive addressing this firm on his firm letterhead.

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Get "RED END" Hack Saws from your dealer

Get Metal Saw Information from Metal Saw Headquarters

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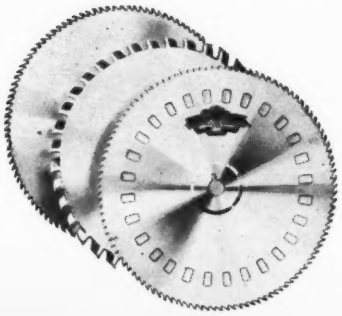

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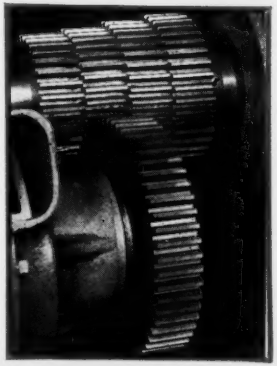

COMPOSITE GEAR DRIVE

The illustration at the left shows the composi gear drive, which provides four wheel speeds fro 2000 to 3000 r. p. m.

For complete details see your distributor at onc He will be glad to give you all the informati you require.

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This new development is also obtainable as a grinder (Model 64 and 65), with the latest types of wheel guards, tool rests and eye shields. Guards are adjustable for various wheel diameters and wheel wear; also so arranged that it is impossible to over-speed the wheel. Designed for heavy, continuous use.

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